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The abstract number for each report is listed at the upper right of the entry. If the number bears an asterisk, the report is title listed only and no abstract is included.

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Technical Operations, Inc.
RESEARCH STUDY LEADING TO THE USE OF TRANSISTORS IN RADIAC SURVEY METERS; QUARTERLY PROGRESS REPORT [FOR] JANUARY 1, 1953 THROUGH MARCH 31, 1953. A. R. Pearlman and R. R. Smyth. 38p. (TOI-53-5; Quarterly Progress Report 3)

USNRDL-390 3690
Naval Radiological Defense Lab.
PERFORMANCE STUDIES ON ANIMALS EXPOSED TO EXTERNAL RADIATION. PART 3. FURTHER STUDIES OF THE EFFECTS OF X IRRADIATION UPON THE PERFORMANCE OF RATS IN A DAILY EXHAUSTIVE EXERCISE TEST. PART 4. THE RELATIONSHIP BETWEEN THE NUMBER OF POST-IRRADIATION EXERCISE TRIALS AND LETHALITY IN ANIMALS EXPOSED TO ROENTGEN RAYS. D. J. Kimeldorf, D. C. Jones, and T. J. Castanera. Feb. 6, 1953. 25p. (USNRDL-390)

WAL-401/88-23 3784
New York Univ. Coll. of Engineering
MECHANISM OF MARTENSITIC TRANSFORMATION OF TITANIUM ALLOYS; INTERIM TECHNICAL REPORT. Y. C. Liu. Mar. 23, 1953. 38p. (WAL-401/88-23; Interim Technical Report 1)

WAL-401/97-18 3783
Battelle Memorial Inst.
THE WELDING OF BETA-STABILIZED TITANIUM ALLOYS; SUMMARY REPORT. G. E. Faulkner, G. B. Grable, and C. B. Voldrich. Jan. 30, 1953. 64p. (WAL-401/97-18)

WAL-401/95-12a 3782
Rensselaer Polytechnic Inst.
THERMAL CYCLES ASSOCIATED WITH THE ARC WELDING OF ½-INCH TITANIUM PLATE; SUMMARY TECHNICAL REPORT. Ernest F. Nippes, John M. Gerken, Bernard W. Schaaf, and Edward C. Nelson. Mar. 1953. 66p. (WAL-401/95-12a; Summary Technical Report 1)

NUCLEAR SCIENCE ABSTRACTS

Vol. 7 July 15, 1953 No. 13

GENERAL

3680
Joint Establishment for Nuclear Energy Research (Norway)
FIRST ANNUAL REPORT [FOR] 1951-52. 25p. (NP-4557)

Research facilities of the Dutch-Norwegian Joint Establishment for Nuclear Energy Research (JENER) are described. The starting up of JEEP, shielding improvements, rearrangement of the thermal column, development of methods for recombination of dissociated D_2O, and flux distribution measurements are discussed. Preliminary chemical research, production of radioisotopes and labeled compounds, physical research and health-physics activities are summarized. (C.H.)

BIOLOGY AND MEDICINE

3681
Institute for the Study of Rate Processes, Univ. of Utah
METHODS FOR MEASURING AND RECORDING OXIDATION-REDUCTION POTENTIALS IN PLANT PREPARATIONS; STUDIES OF PHOTOSYNTHETIC PROCESSES. John D. Spikes, Rufus Lumry, John S. Rieske, and Rudolph J. Marcus. July 15, 1952. 7p. (AECU-2495; Technical Report 6)

A simple, battery-operated impedance-matching circuit for connecting a platinum-calomel electrode system to a Brown recorder for use in recording oxidation-reduction potentials from biological systems is described. Application to the study of the Hill reaction (photolysis of water by isolated chloroplasts) is discussed. Reaction cells and modified Warburg vessels for making potentiometric measurements of photosynthetic systems are discussed. (auth)

RADIATION EFFECTS

3682
Addison H. Gibson Lab., Univ. of Pittsburgh School of Medicine
THE EXPERIMENTAL PRODUCTION OF RADIATION CATARACTS BY FAST NEUTRONS. Campbell Moses, Jay G. Linn, Jr., and Alexander J. Allen. Addison H. Gibson Lab., Univ. of Pittsburgh School of Medicine and Sarah Mellon Scaife Radiation Lab., Univ. of Pittsburgh School of Medicine. [Mar. 10, 1953] 9p. (AECU-2527)

One exposure of 60 to 150 N (ionization chamber techniques) in a collimated beam of 6 to 8 Mev neutrons failed to produce clinically evident lenticular cataracts in dogs over a two-year period of follow-up. In puppies and young dogs some vacuolization of the lens occurred following this dose of radiation, but this was not followed by cataract formation. The administration of 810 to 900 N resulted in cataract formation in 60 to 75% of the eyes of adult dogs. A dose of 1500 N resulted in complete necrosis of the globe, orbit, and surrounding structures in 3 to 4 months after exposure. In 16 rabbits a total neutron whole-body radiation exposure of 52.7 to 83.7 N administered at weekly intervals in doses of 3.1 N failed to produce cataracts in 4 to 12 months follow-up period after cessation of exposure. A single collimated neutron dose of from 33 to 100 N produced definite cataracts in two to five months in the three rabbits exposed. (auth)

3683
Atomic Bomb Casualty Commission
REPORT OF THE MEDICAL EXAMINATION ON THE 78 HIROSHIMA PATIENTS WITH RADIATION CATARACTS. Paul G. Fillmore. July 20, 1951. 13p. (NP-4560)

Seventy-eight Hiroshima patients with radiation cataracts were studied 5 yr after exposure to the atomic bomb. Fifty per cent or more of the patients received near-whole-body radiation exposures. Case histories are summarized. Radiation cataracts were the only late effects observed in these patients attributable to radiation exposure. (C.H.)

3684
Nagasaki Medical School, Nagasaki (Japan)
MEDICAL SURVEY OF ATOMIC BOMB CASUALTIES. Raisuke Shirabe. [nd] 32p. (NP-4561)

A medical survey by a group of Japanese physicians on atomic bomb casualties following the explosion at Nagasaki is reported. A brief description of the city immediately following the explosion is included. Data are summarized on mortality as related to distance from the hypocenter, shielding, thermal and mechanical injury, and radiation injuries. A map of the area is included. (C.H.)

3685
Hiroshima Communications Hospital (Japan)
SYMPOSIUM OF EXPOSED SURVIVORS HELD [IN] HIROSHIMA [ON] MARCH 28, 1952. 25p. (NP-4562)

The experiences of 19 staff members of the Hiroshima Communications Hospital at the time of the atomic explosion, and during the period following the explosion, are summarized. Personal experiences and professional observations are included. (C.H.)

3686
Atomic Bomb Casualty Commission
BIBLIOGRAPHY OF A-BOMB MATERIAL COLLECTED THROUGH APRIL 17, 1952. 27p. (NP-4563)

A list of 124 references is presented covering both published and unpublished material on the effects of the atomic explosions at Hiroshima and Nagasaki. Reports covering field observations on radioactivity induced by the atomic bomb and clinical data on survivors are listed. (C.H.)

3687
Columbia Univ.
FOOD IRRADIATION AND ASSOCIATED STUDIES; PROGRESS REPORT. Dec. 1, 1952. 69p. (NYO-3319; Progress Report 3)

Data are given from studies of the mechanism of the γ-induced oxidation of ferrous sulfate; effects of γ radiation on vitamin A in butter, cheese, cream and margarine; effect of γ radiation on tocopherols and peroxides in wheat germ oil; animal feeding tests designed to test the possible toxicity of foods exposed to high-energy radiations; the mechanism of riboflavin destruction; induced resistance to γ radiation in E. coli; cytoplasmic damage caused by γ radiation in the aquatic fungus A. javanicus; and the effect of γ radiation on oleic acid. (For previous report in this series see NYO-3318.) (C.H.)

3688

Atomic Energy Project, Univ. of Calif., Los Angeles
THE CAPACITY OF THE ANTERIOR PITUITARY GLAND TO FUNCTION AFTER HEAVY IRRADIATION. Bennet M. Allen, Ole A. Schjeide, Ronald T. Piccirillo, and Gerald Kowitz. Submitted Apr. 28, 1953. 25p. (UCLA-254)

The capacity of the pituitary glands to continue secretion of the thyrotrophic hormone after very heavy irradiation was investigated. The method of attack was to transplant the pituitary glands of heavily irradiated recently metamorphosed donor toads into immature unirradiated tadpoles. The amount of stimulation of the thyroid gland induced by these transplants was measured by the growth of the hind limbs and the shedding of the larval cuticular teeth. The former of these criteria proved to be the more sensitive. It was shown that x irradiation up to and including 20,000 r only slightly reduced the functional activity of the transplants. Microscopic study showed that they had not been materially injured by these exposures, and the thyroid glands of the host tadpoles showed the histological picture of high stimulation. These observations demonstrate a picture of continuing thyrotrophic hormone secretion. Gamma irradiation of 50,000 to 200,000 r produced gross injury to the pituitary transplants. However, a slight but statistically significant growth of the hind limbs was observed. These pituitary transplants showed greatly modified basophilic and acidophilic cells still distinguishable after an irradiation of 100,000 r, but the volume of the glands was greatly reduced. Even after an irradiation of 150,000 r a fair amount of glandular tissue remained, but after 200,000 r this was reduced to a small clump of sparse abnormal cells. (auth)

3689

Atomic Energy Project, Univ. of Calif., Los Angeles
BLOOD RETENTION OF INTRAVENOUSLY INJECTED COLLOIDAL PRODIGIOSIN IN NORMAL AND X-IRRADIATED RABBITS: AN INDEX OF PHAGOCYTIC FUNCTION IN THE RE SYSTEM. George V. Taplin, Camille Finnegan, Philip Noyes, and Gerald Sprague. Submitted May 1, 1953. 24p. (UCLA-255)

The retention of intravenously injected colloidal prodigiosin in the blood plasma has been demonstrated to be an index of phagocytic function in the reticulo-endothelial (RE) system of rabbits. Whole-body x-radiation exposures in doses between 800 and 1200 r are followed by highly significant increases in the blood retention of this dye. Shielding the liver-spleen areas with lead during lethal (1200 r) exposures results in lowered mortality and maintenance of normal plasma prodigiosin levels throughout the first 28 days post-irradiation. Conversely, local irradiation of the liver-spleen areas with the remaining body areas lead-shielded is followed by elevated prodigiosin blood levels and high mortality when dosage is raised to only 2400 r. When the RE system is partially blocked with india ink, striking increases in blood prodigiosin concentrations are found within 24 hr after 1000 r exposures in the blocked versus normal animals. The relationships between mortality, spleen weight, bacteremia, distribution of prodigiosin in the RE organs and variations in plasma retention of the colloidal dye following whole-body x irradiation in rabbits are discussed with respect to the possible mechanisms involved in the bacterial complications occurring during the acute radiation syndrome. The relationship between alterations in phagocytic function in the RE system and resistance or vulnerability to whole-body radiation exposure is demonstrated. Prophylactic administration of agents believed to have stimulating or proliferative effects on the RE function is suggested as an adjunct to the therapeutic armamentarium in the management of the acute radiation syndrome in rabbits. The prodigiosin blood-retention test for phagocytic function is a tool which may help guide future therapeutic investigations into proper channels. (auth)

3690

Naval Radiological Defense Lab.
PERFORMANCE STUDIES ON ANIMALS EXPOSED TO EXTERNAL RADIATION. PART 3. FURTHER STUDIES OF THE EFFECTS OF X IRRADIATION UPON THE PERFORMANCE OF RATS IN A DAILY EXHAUSTIVE EXERCISE TEST. PART 4. THE RELATIONSHIP BETWEEN THE NUMBER OF POST-IRRADIATION EXERCISE TRIALS AND LETHALITY IN ANIMALS EXPOSED TO ROENTGEN RAYS. D. J. Kimeldorf, D. C. Jones, and T. J. Castanera. Feb. 6, 1953. 25p. (USNRDL-390)

The effect of whole-body x irradiation on intensive exercise performance by male rats was observed for several weeks following irradiation. Swimming to exhaustion was the performance test used. Animals were tested daily, 5 times per week, for 2 weeks prior to irradiation, and, on the same test schedule, for as long as 9 weeks post-irradiation. Exposure to x-ray doses of 300 to 1000 r depressed the ability to perform. The magnitude of the depression in performance was dependent upon the x-ray dose. Irradiated animals surviving the period of testing recovered sufficiently by the ninth week after irradiation to attain their pre-irradiation performance level although they were not identical in performance with concurrently tested non-irradiated animals. Animals which died soon after irradiation were nearly normal in performance prior to death; animals which died later had a lower performance level varying with the length of the post-irradiation survival period. In a second series of tests, rats were exercised to exhaustion daily, 5 times per week, for 2 weeks prior to irradiation, and then divided into 6 groups and irradiated with 500 r of x rays. The groups were then subjected to various numbers of post-irradiation daily-exercise trials, and the survival rates for each group were compared with that for non-exercised irradiated control animals. It was found that repeated exercise during the first 3 weeks after irradiation increased radiation mortality in proportion to the total number of exercise trials. Continuation of exercise beyond this period resulted in no further increase in radiation mortality. (auth)

3691

ACTION OF RADIATION OF RADIOACTIVE PHOSPHORUS (P^{32}) ON RABBIT SKIN. V. S. Menasov. Vestnik Venerol. i Dermatol. 16-20(1953) Jan.-Feb. (In Russian).

The skin of rabbits was exposed to varying doses of β radiation from P^{32}. The dermal layer swelled rapidly and there was a large amount of infiltration of histocytes and polynuclears. With 800 r the epidermis had slight protuberances. Monotropic changes occur both in coarse nerve trunks and in capillary nerve fibrils. At doses of 600 r the hair begins to fall out and there is histologic evidence of atrophy of capillary follicles. Doses of 3000 r produce deep ulcers and extensive scarring. (J.S.R.)

3692

THE LETHAL DOSE OF WHOLE-BODY TANTALUM^{182} GAMMA IRRADIATION FOR THE BURRO (EQUUS ASINUS ASINUS). John H. Rust, James L. Wilding, Bernard F. Trum, C. S. Simons, A. W. Kimball, Jr., and Cyril L. Comar. Radiology 60, 579-82(1953) April.

Eighty sexually mature female burros were exposed, in groups of 10 animals each, to 300, 400, 530, 570, 640, 645, 700, and 820 r of Ta^{182} whole-body γ irradiation upon a specially constructed exposure field at a rate of 18 to 23 r/hr. The $LD_{50}/_{30}$ value was estimated to be 651 r, with a 95% confidence interval of 621 to 683 r. The mean survival time of all animals dying of acute whole-body irradiation was 26.5 days. The range of survival time was 20 to 41 days. (auth)

3693

WHOLE BODY IRRADIATION OF LARGE ANIMALS. Bernard F. Trum. Military Surgeon 112, 333-41(1953) May.

Observations are reported made on some 150 burros irradiated on an exposure field activated by Ta^{182} and Co^{60} and designed in such a manner as to produce a near-constant flux of γ radiation on any part of the field. Comparison is made with findings in studies of the effects of radiation on other experimental animals. (C.H.)

3694

THE BASIS OF THE OXYGEN EFFECT ON X-IRRADIATED DROSOPHILA SPERM. William K. Baker and Elizabeth S. Von Halle. Proc. Natl. Acad. Sci. U.S. 39, 152-61(1953) March.

A study of the relation between x-ray dosage and O_2 concentration on the induction of dominant lethals in mature sperm of D. melanogaster shows that the frequency of dominant lethals induced upon irradiation in N_2 is reduced much less than would be expected on the hypothesis that O_2 concentration is affecting the number of primary breaks induced. Fewer dominant lethals are recovered in sperm exposed in air when at least 24 hours have elapsed between treatment and insemination than when insemination very shortly follows treatment. This effect is not observed in N_2-treated sperm. These data can be interpreted on the basis that the O_2 concentration affects the amount of restitution of chromosome breaks taking place in the sperm. A low O_2 concentration during irradiation makes restitution more likely, and the broken ends apparently restitute more quickly. Therefore, the data lend support to the differential reunion hypothesis of O_2 action rather than to the differential breakage hypothesis. (auth)

3695

THE EFFECT OF BORON ENRICHMENT ON SLOW NEUTRON-IRRADIATED TISSUES. Alan D. Conger. Genetics 38, 128-33(1953) March.

An increase in the amount of biological effect (chromatid aberrations in Tradescantia) produced by a unit dose of thermal neutrons has been caused by an enrichment of the B content of the tissue. The separated stable isotope B^{10} was used for enrichment because of its high capture cross section for thermal neutrons. The increase in effect is due to the α rays from the $B^{10}(n,\alpha)Li^7$ reaction. For the same neutron dose, the enriched plants showed 4 to 5 times as many chromatid aberrations as the nonenriched normal plants. On the basis of the B enrichment, measured chemically, a somewhat greater increase was expected. Disagreement was probably due to nonsurvival of the flower buds with higher B content, which were included in the chemical sample, but excluded from observation in the biological sample because of death. (auth)

3696

FURTHER INVESTIGATIONS INTO THE PROBLEM OF THE WHOLE-BODY IRRADIATION OF THE WHITE MOUSE. INSTANTANEOUS DEATH BY RADIATION. B. Rajewsky, O. Heuse, and K. Aurand. Z. Naturforsch. b8, 157-9(1953) Mar. (In German)

White mice were subjected to radiation from Ra and x rays in doses varying from 250 r to over 190,000 r. The resultant shortening of the life span proved dependent on both the amount of the complete dose and the dose rate. The effects of varying radiation doses up to the time of death are described. (J.S.R.)

3697

SENSITIZATION AND REACTIVATION OF X-IRRADIATED COLON-BACTERIA THROUGH HEAT. H. Langendorff, M. Langendorff, and K. Sommermeyer. Z. Naturforsch. b8, 117-22(1953) Mar. (In German)

When the cells of Escherichia coli B are exposed to a high temperature for a short time before x-irradiation, their radiation resistance is diminished. The average lethal dose can be lowered to half the control value. A reactivation of the inactive cells is possible by heat treatment after radiation. The reactivation rate of the sensitized bacteria is substantially higher than that of the cells not heated before irradiation. The general rule for Escherichia coli B is that the reactivation rate is higher, the greater the radiation sensitivity. This is true for bacteria inactivated by ultraviolet light as well as by x radiation. (tr-auth)

3698

INFLUENCE OF BETAMERCAPTOETHYLAMINE AND THYMUS EXTRACT ON THE NUMBER OF GUINEA PIGS SURVIVING IRRADIATION WITH X RAYS. Charles-M. Gros and Jean Comsa. Compt. rend. 236, 1611-13(1953) Apr. 20. (In French)

A comparison of the prophylactic effects of β-mercaptoethylamine and thymus extract has been made. Male guinea pigs, weighing 200 ± 15 g and divided into four groups of 15, each received the following treatment: group 1 was injected intraperitioneally with 20 mg of β-mercaptoethylamine immediately after irradiation; group 2 received subcutaneous injections of thymus extract the day after irradiation; group 3 received both treatments; and group 4 had no treatments. At the end of 5 months seven animals of group 1 survived, 6 of group 2, 12 of group 3, and 3 of group 4. (J.S.R.)

RADIATION HAZARDS AND PROTECTION

3699

Atomic Energy Project, Western Reserve Univ.

THE INABILITY OF CROSS TRANSFUSION OR SPLEEN PERFUSION TO AFFECT THE SURVIVAL OF X-IRRADIATED DOGS. Jack R. Leonards, Charles R. Heisler, G. Warren Buckaloo, Paul S. Lavik, and Hymer L. Friedell. Issued Apr. 10, 1953. 16p. (NYO-4012)

Cross transfusion was carried out between normal donor dogs and experimental animals given 550 r whole-body x irradiation. The amount of blood exchanged was varied from $\frac{1}{3}$ to 4 times the animal's body weight. This procedure carried out immediately after irradiation had no significant effect on the clinical condition or ultimate survival of the animals. Repeated cross transfusions were performed at intervals of several days following irradiation. This procedure was effective in raising the white cell count to within normal limits but the transfused cells disappeared from the circulation within 48 hrs. No beneficial effects were observed in the irradiated animals. The blood from the femoral artery of irradiated dogs (700 r) was perfused through a spleen obtained from a donor dog and continuously returned to a vein. This procedure slightly prolonged the survival time but had no significant effect on the clinical condition or ultimate survival of the irradiated animal. (auth)

3700

CONTRIBUTION OF RADIOCHEMISTRY TO RADIOBIOLOGY. C. Piffault, J. Duhamel, D. Longuet. Acta Radiol. 39, 64-72(1953) Jan. (In French)

Certain lipids possess a protective effect against irradiation of unicellular organisms. Some recent studies indicate that a modification of the suprarenal emission of lipids plays a role in the protection against irradiation in higher organisms. In the present investigation, a spectrophotometric study is made of the protective effect of one constituent of the lipids, glycerol, upon several colored oxidation-reduction tests. The mechanism of this effect is found to be associated with the presence of O_2 in the enviroment, a fact which confirms some recent results. (auth)

3701

SLOW NEUTRON INDUCED RADIOACTIVITIES OF NUCLEAR EXPLOSIONS. III. C. E. Mandeville. J. Franklin Inst. 133 -7(1953) Feb.

Calculations of the radioactivities produced by underwater and underground bursts previously reported (see NSA 5-6988) have been corrected and extended. The tables have been arranged in more convenient form, time periods have been extended to 10 yr, and the contribution of specific radioisotopes is given greater stress. (G.Y.)

3702

EFFECT OF ANTIHISTAMINE SALVE ON X-IRRADIATED SKIN. A. Stolz. Deut. med. J. 3, 582-4(1952) Dec. 15. (In German)

The skin phenonema directly produced by x rays are related to the setting free of histaminic substances. These skin reactions show a good response to antihistamine salve, the skin tolerance being raised at the same time. Of particular benefit is the rapid alleviation of the radiation pruritis and the avoidance of objectionable interruption of the x-ray therapy by radiation effects on the skin. The author reports both objective and subjective results of self-experimentation by means of 200- to 1400-r x irradiations on the thigh. (G.Y.)

3703

INFLUENCE OF HOMOLOGOUS TISSUE FACTORS ON DNA TURNOVER AND RADIATION PROTECTION. Lola S. Kelly and Hardin B. Jones. Am. J. Physiol. 172, 575-8 (1953) March.

Studies reported indicate that substances capable of stimulating desoxypentose nucleic acid formation can be obtained from mashes and extracts of rapidly growing tissues and that these substances may offer some protection after exposure to radiation. (C.H.)

RADIATION SICKNESS

3704

EFFECT OF ACTH, CORTISONE, AND DCA ON THE RADIATION SYNDROME. Erik Odeblad. Svenska Läkartidn. 49, 2835-9(1952) Nov. 14. (In Swedish)

Groups of male mice of 20 to 24 g weight were injected with adrenocorticotropic hormone (ACTH), cortisone, or desoxycorticosterone acetate (DCA) either 1 hr before or 1 hr after 650-r whole-body irradiations. Weight changes and mortality data are tabulated. (G.Y.)

3705

SEVERE RADIONECROSIS TREATED AND CURED BY ELECTROCOAGULATION. M. Protar, J. Philippon, and J. Delmas. J. radiol. et électrol. 33, 421-2(1952). (In French)

A case history. (G.Y.)

RADIOGRAPHY

3706

RADIOAUTOGRAPHY: THEORY, TECHNIC, AND APPLICATIONS. Patrick J. Fitzgerald, Eva Simmel, Jerry Weinstein, and Cynthia Martin. Lab. Invest. 2, 181-222 (1953) May-June.

The theory and technics of radioautography are described, the latter in detail. The recorded applications of the methods are summarized. It is believed that the technic is an important one in the field of biology because of the necessity of knowing whether individual cells or cell units preferentially concentrate radioactive substances in contrast to the uniform distribution in an organ presumed when organ or animal radioactivity is counted by Geiger-Müller technics. The method focuses attention upon the metabolism of individual cell types or units. 79 references. (auth)

RADIOTHERAPY

3707

INTRACAVITARY COLLOIDAL RADIOGOLD IN THE TREATMENT OF EFFUSIONS CAUSED BY MALIGNANT NEOPLASMS. Gould A. Andrews, Sam W. Root, Herbert D. Kerman, and Robert R. Bigelow. Ann. Surg. 37, 375-81(1953) March.

Intracavitary injection of colloidal radiogold appears to be a worthwhile palliative measure in selected patients with pleural effusions or ascites caused by malignant neoplasms. The results of such treatment in a group of 24 patients are reported. (auth)

3708

METABOLISM AND DISTRIBUTION OF COLLOIDAL Au^{198} INJECTED INTO SEROUS CAVITIES FOR TREATMENT OF EFFUSIONS ASSOCIATED WITH MALIGNANT NEOPLASMS. Gould A. Andrews, Samuel W. Root, and Ralph M. Kniseley. Cancer 6, 294-302(1953) March.

Data on the fate and distribution of intracavitary injected colloidal Au^{198}, based on studies of 30 patients treated with this isotope for effusions caused by malignant neoplasm, are summarized. (C.H.)

3709

THE DOSIMETRY OF ARTIFICIAL RADIOACTIVE ISOTOPES. W. V. Mayneord and W. K. Sinclair. Advances in Biol. Med. Phys. 3, 1-63(1953)

Fundamental principles of dosimetry of artificial radioactive isotopes are briefly outlined. Practical problems involved in the application of established principles to the individual patient are discussed in detail. Problems considered include those of absolute energy units, dosage rates due to radioactive sources emitting γ radiation, geometrical distribution of γ radiation, dosimetry of β rays, integral dose, dosimetry in clinical practice, absolute amount of radioactive material, the half life of the materials in the body, dosimetry in selected clinical techniques, internal administration involving metabolic properties, internal administration involving physical state of the agent, local applications of discrete sources, teletherapy, and dosimetry in diagnostic techniques. 117 references. (C.H.)

TOXICOLOGY STUDIES

3710

Rochester Univ. School of Medicine and Dentistry

THE EFFECT OF VARIOUS PATHOLOGICAL CONDITIONS ON IN VIVO HEMOGLOBIN SYNTHESIS. I. HEMOGLOBIN SYNTHESIS IN BERYLLIUM INDUCED ANEMIA AS STUDIED WITH ALPHA-C^{14}-ACETATE. H. E. Stokinger, K. I. Altman, and Kurt Salomon. 1952. 12p. (AECU-2534)

The biosynthesis of newly formed intraerythrocytic hemin and globin has been studied by means of α-C^{14}-acetate in rabbits exposed to BeF_2. It was found that the per cent of the administered C^{14} dose incorporated into hemin and globin in the anemic animals was significantly lower than in the controls. The ratios of globin to hemin C^{14} activities on a millimolar basis exhibit no significant differences in Be-exposed and normal rabbits. The bearing of these findings on the mechanism of hematopoiesis in Be-poisoned rabbits is discussed. (auth)

3711
ON THE PROBLEM OF RADIUM POISONING. 6. THE EXCRETION OF RADIOACTIVE MATERIALS FROM THE HUMAN BODY. (RESEARCH RESULTS OF TWO INSTANCES OF RADIUM POISONING). B. Rajewsky and H. Muth. Translated by I. A. Warheit from Strahlentherapie 88, 261-75(1952). 24p. (AEC-TR-2021)

Two cases of Ra poisoning are reported. Clinical findings and laboratory data are summarized. (C.H.)

3712
EXPERIMENTAL INVESTIGATION OF TOXICITY OF FLUORINE IN LOW CONCENTRATION. R. D. Gabovich. Gigiena i Sanit., 9-15(1953) Jan. (In Russian)

Structural changes in bones and teeth and other physiological effects in rats given drinking water containing 1.5 to 500 mg of F/liter of H_2O are described. (G.Y.)

CHEMISTRY

3713
Atomic Energy Research Establishment, Harwell, Berks (England)
THE SATURATED VAPOUR PRESSURE OF ETHYLENE AT LOW TEMPERATURES AND THE MAGNITUDE OF THERMOMOLECULAR PRESSURE DIFFERENCES IN TUBES OF VARIOUS DIAMETERS. B. A. J. Lister and L. A. McDonald. Feb. 28, 1953. 14p. (AERE-C/R-1122)

The saturated vapor pressure of ethylene has been measured under conditions where corrections for thermomolecular pressure difference can be accurately calculated. Good agreement is found with values obtained by earlier mass spectrometric observations. Experiments have been made to determine the magnitude of the thermomolecular pressure difference using tubes of different diameters at the surface of the cooling bath. (auth)

3714
Massachusetts Inst. of Tech. Engineering Practice School, Oak Ridge
EFFECT OF PULSE COLUMN OPERATING VARIABLES ON H.T.U. (thesis). Myron W. Belaga and John E. Bigelow. Jan. 11, 1952. 68p. (KT-133; EPS-K-181)

The effect (at constant flow rate) of varying pulse height from $^1/_8$ to 2 in. and pulse frequency from 20 to 80 cycles/min in a pulse column was found to cause the H.T.U. over-all, based on the extract phase, to range from 2.63 to 6.25 in. The chemical system employed was methyl isobutyl ketone, water, and acetic acid, the acid being extracted from the dispersed aqueous phase. Graphs are presented showing the variation in H.T.U. with frequency at constant pulse height, and the variation in H.T.U. with pulse height at constant frequency. The product of pulse height and frequency, called pulsing velocity, is shown to correlate with H.T.U. (auth)

3715
Naval Research Lab.
THERMAL PROPERTIES OF SODIUM HYDROXIDE AND LITHIUM METAL; QUARTERLY REPORT [FOR] MAY 1 TO AUGUST 1, 1952. R. R. Miller. 13p. (NRL-3230-201/52; Progress Report 2)

NaOH-container materials studied to date have included Fe, stainless steel 304 and 310, two high Ni alloys, commercial Ni, electrolytic Ni, Au and Ag. Indications are that the more nearly pure the Ni the more resistant it is to attack by NaOH. Au and Ag appear to be satisfactory for limited use as container materials. Chemical reactions which may partially explain the corrosion mechanism are postulated. The general methods of measuring thermal conductivity of liquids have been reviewed and the method considered satisfactory for measurements on NaOH described. Apparatus for the measurement of thermal conductivity of liquid Li metal is being constructed. (auth)

3716
Naval Research Lab.
THERMAL PROPERTIES OF SODIUM HYDROXIDE AND LITHIUM METAL; QUARTERLY PROGRESS REPORT [FOR] AUGUST 1 TO NOVEMBER 1, 1952. R. R. Miller. 7p. (NRL-3230-231/52; Quarterly Progress Report 3)

The results obtained in a study of the thermal properties of NaOH contained in a Au tube with and without other metals are discussed. There is an increase in the stability of the hydroxide in Au compared with other metals, but above 1000°C some reaction occurs in the Au. (auth)

3717
Pennsylvania State Coll.
DETERMINATION OF FORMATION CONSTANTS OF ACETYLACETONATES BY A DISPLACEMENT REACTION. Burl E. Bryant. Apr. 1, 1953. 11p. (NYO-3633)

The formation constants of acetylacetonates were determined by a displacement reaction. This procedure, a rapid and widely applicable method, yields results more reliable than the potentiometric method of determining formation constants. Values are given for a Cu^{++} displacement of Ni^{++}. (J.S.R.)

ANALYTICAL PROCEDURES

3718
Atomic Energy Research Establishment, Harwell, Berks (England)
THE ANALYSIS OF URANIUM-ZIRCONIUM ALLOYS. G. W. C. Milner and A. F. Skewies. Mar. 8, 1953. 17p. (AERE-C/R-1126)

A satisfactory procedure is described for the analysis of U-Zr alloys containing up to 25% Zr. It is based on the separation of the Zr from the U by dissolving the cupferron complex of the former element into chloroform. After the evaporation of the solvent from the combined organic extracts, the residue is ignited to Zr oxide. The latter is then re-dissolved and Zr is separated from other elements co-extracted in the solvent extraction procedure by precipitation with mandelic acid. The Zr mandelate is finally ignited to oxide at 960°C. The U is separated from the aqueous solution remaining from the cupferron extraction by precipitating with tannin at a pH of 8; the precipitate being removed by filtration and then ignited at 800°C. The residue is dissolved in nitric acid and the U is finally determined by precipitating as ammonium diuranate and then igniting to U_3O_8. (auth)

3719
Ames Lab.
TITRATION OF WEAK BASES IN ACETIC ANHYDRIDE SOLVENT MIXTURES. James S. Fritz and Myron O. Fulda. Apr. 1953. 18p. (ISC-331)

The purpose of this investigation is to study the effect of titrating bases in organic solvents from which the last traces of water have been removed by the addition of excess acetic anhydride. For most tertiary amines and alkali metal salts, this increases considerably the sharpness of the break and rise in potential at the end point. A very large excess of acetic anhydride does not further increase the sharpness of the end point. The method proposed gives excellent results for tertiary amines including nitrogen heterocyclics of the purine, pyridine, pyridone, and thiazole type. Primary, secondary, and a few heterocyclic amines cannot be titrated. This method offers increased accuracy and broadens the scope of titrations in nonaqueous solvents to include weaker bases than formerly could be titrated. (auth)

3720

Oak Ridge National Lab.

THE DETERMINATION OF TRACES OF HYDROGEN FLUORIDE IN INERT GASES. D. L. Manning and J. C. White. Apr. 10, 1953. 14p. (ORNL-1538)

A method has been developed for the determination of traces of HF in inert gases. The gases are passed through 0.01 M boric acid, and the increase in conductivity of the solution, which results from the reaction of HF with boric acid to form a complex, strong acid, is measured. The actual acid formed by this reaction has been postulated as monohydroxyfluoboric acid. The method is particularly applicable for industrial use in which no other ionizable gases are present. As little as 10 μg of HF can be determined by this procedure. (auth)

3721

DETERMINATION OF RADIOIRON BY THE ELECTROLYTIC METHOD. Jean Govaerts and Albert Lambrechts. Bull. soc. roy. sci. Liège 21, 531-6(1952) Dec. (In French)

Electrolytic deposition of thin films containing Fe^{59} or Fe^{55} for radiometric determination is facilitated by a simply constructed bank of cells permitting simultaneous electrolysis of 12 solutions. (G.Y.)

3722

IONIUM DETERMINATION IN DEEP-SEA SEDIMENTS. N. Isaac and E. Picciotto. Nature 171, 742-3(1953) Apr. 25.

An ion-exchange method, using UX_1 (Th^{234}) as tracer for the Io (Th^{230}) and nuclear emulsion as α-particle detector, has been developed to measure that Io content of deep-sea sediments. A concentration of 10^{-11} g/g in a sample weighing 0.5 g can be detected. (G.Y.)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

3723

Radiation Lab., Univ. of Calif., Berkeley

CRYSTAL STRUCTURES OF AMERICIUM COMPOUNDS. D. H. Templeton and Carol H. Dauben. Feb. 3, 1953. Decl. May 12, 1953. 16p. (AECD-3521; UCRL-2101)

The crystal structures of several compounds of Am, element 95, have been determined by the x-ray powder-diffraction method. AmF_3 is hexagonal (LaF_3 type) with $a = 4.067 \pm 0.001$ and $c = 7.225 \pm 0.002$ A for the pseudocell that explains the powder data. AmO_2 is cubic (CaF_2 type) with $a = 5.383 \pm 0.001$ A. AmOCl is tetragonal (PbFCl type) with $a = 4.00 \pm 0.01$ and $c = 6.78 \pm 0.01$ A. The metal parameter is 0.18 ± 0.01. Am_2O_3 is cubic when prepared at 600°C and hexagonal when prepared at 800°C. For the cubic form (Mn_2O_3 type), $a = 11.03 \pm 0.01$ A. The metal parameter is −0.030 ± 0.002. For the hexagonal form (La_2O_3 type), $a = 3.817 \pm 0.005$ and $c = 5.971 \pm 0.010$ A. (auth)

3724

CRYSTAL CHEMICAL STUDIES OF THE 5f-SERIES OF ELEMENTS. XIX. THE CRYSTAL STRUCTURE OF THE HIGHER THORIUM HYDRIDE, Th_4H_{15}. W. H. Zachariasen. Acta Cryst. 6, 393-5(1953) May 10.

Using x-ray-diffraction data, it is conclusively shown that the chemical formula for the higher thorium hydride is Th_4H_{15}. The unit cube contains four stoichiometric molecules, and the unit cell constant is $a = 9{\cdot}11 \pm 0{\cdot}02$ A. The space group is $I\bar{4}3d$ and the Th atoms are in the 16-fold positions with parameter $x = 0{\cdot}208 \pm 0{\cdot}003$. It is shown that the 60 H atoms are in positions 12(a) and 48(e). The parameter values $x = 0{\cdot}400$, $y = 0{\cdot}230$, $z = 0{\cdot}372$ are suggested for the latter sites. A Th atom is bonded to 12 H atoms, three in positions 12(a) and nine in 48(e). A H atom (H_I) in 12(a) is bonded to four Th atoms, a H atom (H_{II}) in 48(e) to three Th atoms. The interatomic distances are $Th-H_I = 2{\cdot}46$ A, $Th-H_{II} = 2{\cdot}29$ A. The structure is discussed in some detail. (auth)

DEUTERIUM AND DEUTERIUM COMPOUNDS

3725

ISOTOPIC PROPORTION OF WATER BY MEASUREMENT OF ABSORPTION IN THE INFRARED. J. Lecomte, M. Ceccaldi and E. Roth. J. chim. phys. 50, 166-9(1953) Mar. (In French)

The determination of heavy H_2O, more than 96% D_2O, has been carried out by means of the measurement of absorption by a band located at about 1.66 μ. The precision obtained is greater than 0.1% in D_2O. The origin of the band used is discussed, and a provisional attribution is developed for the vibration $V_1 + V_3$ of HDO. (tr-auth)

FLUORINE AND FLUORINE COMPOUNDS

3726

ON THE TRANSFORMATIONS OF POLYTETRAFLUOROETHYLENE. Raymond Carré and René A. Pâris. Compt. rend. 236, 1559-61(1953) Apr. 30. (In French)

Differential thermal analysis has permitted the determination of the two zones of transition of polytetrafluoroethylene by showing clearly the double decomposition at each of the transformations. Studies have been made on both tempered and annealed samples of the polymer. (tr-auth)

LABORATORIES AND EQUIPMENT

3727

Atomic Energy Research Establishment, Harwell, Berks (England)

CALORIMETERS AND CALORIMETRIC HEATS OF ADSORPTION. E. M. Dresel. Feb. 1953. 16p. (AERE-C/R-1105)

A critical survey is presented of different types of calorimetric apparatus described in the literature, with special reference to systems suitable for the calorimetric measurement of the heat of adsorption. Factors influencing the choice of a new microadsorption calorimeter are discussed. (auth)

3728

Argonne National Lab.

SHIELDED HOOD MODEL 1. Roland A. Blomgren. Jan. 1953. 7p. (ANL-4964)

The shielded hood described and illustrated uses master-slave manipulators for hand operations and has 3 in. of steel for radiation protection around the sides but is open at the top except for a ventilation seal. Its main advantages are cross flow ventilation, complete access for setup and cleanup from the front or operator's side, and also the window and manipulating arrangement. (auth)

3729

Radiation Lab., Univ. of Calif., Berkeley

EFFECT OF BAFFLING AND IMPELLER GEOMETRY ON INTERFACIAL AREA IN AGITATED TWO-PHASE LIQUID SYSTEMS. H. E. Rea, Jr. and T. Vermeulen. Apr. 3, 1953. 109p. (UCRL-2123)

The investigation was undertaken to extend previous measurements of the interfacial area formed under baffled conditions of agitation in a cylindrical tank and to measure the interfacial area formed under unbaffled conditions. The two-phase systems studied were dispersions in H_2O of isooctane (2,2,4-trimethylpentane), CCl_4, CS_2, n-butanol, and methyl isobutyl ketone. All measurements were made at 20 ± 0.5°C. Interfacial areas were determined by light-transmission measurements through the unstable emulsion formed during agitation. Impeller geometry was one of the physical variables studied. In tests with four-bladed flat paddles at equal speed, the interfacial area was found to increase more than linearly with paddle length, but to be independent of paddle width; it is concluded that the drop diameter is controlled by the highest intensity of turbulence reached at any point in the tank. The effect of physical properties of the fluids, stirring speed, impeller geometry, and relative proportions of the two phases on interfacial area also were studied. Power requirements for the agitation of these systems were investigated and were found to be identical with those for a homogeneous liquid of equal mean density. The results indicate that high values of interfacial area may be obtained under mixing conditions requiring the minimum power consistent with homogeneous dispersion, in any specific system. (G.Y.)

RADIATION EFFECTS

3730

Brookhaven National Lab.
THE POLYMERIZATION OF VINYL MONOMERS BY INTENSE GAMMA RADIATION; PROGRESS REPORT ON FISSION PRODUCTS UTILIZATION, PART 5. UNCLASSIFIED SECTION. D. Ballantine and B. Manowitz. Mar. 1953. 13p. (BNL-229)

The γ-ray-induced polymerization of styrene and methyl methacrylate has been investigated and has been shown to be free radical in nature. Both monomers show a constant rate of polymerization in the initial stages followed by a rapid increase similar to a "Trommsdorf" effect. Molecular weight increase occurs with the increased rate. There is some indication of surface effect on polymerization rate and of crosslinking of polymer. Activation energies for combined propagation and termination rates have been calculated and agree well with published values for free-radical polymerizations involving bimolecular termination. Experimental results are discussed and future plans outlined. (auth)

3731

PHYSICAL AND CHEMICAL EFFECTS OF STRONG RADIATION. W. Hanle. Angew. Chem. 65, 225-30(1953) May 7. (In German)

The chemical and physical effects of energetic radiation are reviewed. The ionization and excitation of atoms and molecules by particle and wave radiation are discussed, particularly the origin of secondary radiation. Some examples of chemical changes are given. 29 references. (J.S.R.)

3732

EFFECT OF IONIZING RADIATION ON AQUEOUS SOLUTIONS OF PHOSPHITES. M. Cottin and M. Haïssinsky. J. chim. phys. 50, 195(1953) Mar. (In French)

The effects of x rays 1 A in length, Ra γ rays, and Rn α rays on the phosphite-phosphate system have been studied. HPO_3^{--} in the presence or absence of air is oxidized completely by sufficiently intense irradiation. Phosphates are reduced neither by γ rays nor α rays. The phosphites are more easily oxidized in acid medium. The probable mechanisms of the reactions are discussed. (J.S.R.)

3733

REDUCTION OF FERRIC ION IN AQUEOUS SOLUTION BY γ-RADIATION. C. B. Amphlett. Nature, 690-1(1953) Apr. 18.

The mechanism by which a ferrous-ferric steady state is established on irradiation of either ferric or ferrous solutions has been investigated. The two steady states are not the same, indicating that the ferrous-ferric couple is not thermodynamically reversible with respect to H atoms and OH radicals. (G.Y.)

3734

RADIOCHEMICAL REDUCTION OF FERRIC ORTHOPHENANTHROLINE IN AQUEOUS SOLUTION BY GAMMA RAYS. J. Pucheault and M. Lefort. J. chim. phys. 50, 196(1953) Mar. (In French)

Ferric orthophenanthroline, 0.5M, was irradiated with γ rays. In air the formation of Fe^{++} continues after the completion of the radiation and does not reach a maximum for several hours. The after-effect is due to the formation of H_2O_2 or organic peroxides during the radiation. In the absence of air, there is no after-effect. (J.S.R.)

RARE EARTHS AND RARE-EARTH COMPOUNDS

3735

INVESTIGATION OF STRUCTURES OF SOME COMPOUNDS OF RARE EARTH ELEMENTS. V. I. Iveronova, V. P. Tarasova, and M. M. Umanskii. Translated by S. Shewchuck from Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 15, 164-9(1951). 9p. (AEC-TR-2029; UCRL-Trans.-138)

The crystal systems of some sulfates, nitrates, and chlorides of La, Pr, Nd, and Sm have been determined by x-ray diffraction. The spatial group and the position of the heavy atoms were also determined. (J.S.R.)

3736

SEPARATION OF THE RARE EARTHS BY PAPER CHROMATOGRAPHY. Michaël Lederer. Compt. rend. 236, 1557-9(1953) Apr. 20. (In French)

The preliminary results of a paper-chromatographic method for the rapid separation of rare earths are described. Acetylacetone is used for the complexing agent. (J.S.R.)

3737

IMPROVEMENTS TO THE METHOD OF SEPARATION OF RARE EARTHS BY ION EXCHANGE. Félix Trombe and Jean Loriers. Compt. rend. 236, 1567-9(1953) Apr. 20. (In French)

The rare earths will adsorb selectively from citric acid solution on exchange resin if the pH is closely controlled. The citric acid solution can be passed through an auxiliary column to ensure complete removal of the rare earths. Economic quantities of high purity can be obtained. (J.S.R.)

SEPARATION PROCEDURES

3738

Metals Research Lab., Carnegie Inst. of Tech.
ELECTROCHEMICAL SEPARATIONS IN NON-AQUEOUS SOLUTIONS: QUARTERLY PROGRESS REPORT FOR THE PERIOD SEPTEMBER 1, 1952 TO DECEMBER 1, 1952. G. M. Pound. Jan. 1, 1953. Decl. May 15, 1953. 9p. (AECD-3522; NYO-6010; Quarterly Progress Report 1)

An electrolytic cell is being constructed to measure the decomposition potentials of pure salts of metals ranging from Zn^{65} to Gd^{157}. The solvent for these salts will, in general, be non-aqueous. The solvent will usually be a mixture of other molten salts, such as the LiCl-KCl eutectic mixture (m.p. = 355°C). It is hoped to establish an emf series for the subject elements in various solvents. An investigation of the effect of anode material on decomposition potential has been started. It was found that the measured decomposition potential at 400°C of KCl in the LiCl-KCl eutectic solvent using a Pt anode is 2.4 v, whereas a value of 3.0 v was obtained using a carborundum anode. The decomposition potential calculated from thermodynamic data is 3.9 v. Decomposition potentials for some other salts have been calculated from thermodynamic data. (auth)

3739

SEPARATION PROCEDURE FOR THE RARE EARTHS BY LOCALIZATION ON ION EXCHANGE RESINS. Félix Trombe and Jean Loriers. Compt. rend. 236, 1670-2(1953)

Apr. 27. (In French)

Performance of a set of small ion-exchange columns connected in series and arranged for separate elution of each column is described. The apparatus is suitable for separation of several kilograms of rare earths per operation. (G.Y.)

3740

SEPARATION OF AcB AND AcC″ BY PAPER CHROMATOGRAPHY. Marguerite Perey and Jean-Pierre Adloff. Compt. rend. 236, 1664-6(1953) Apr. 27. (In French)

In studying the chromatographic separation of AcK(Fr^{223}), the authors observed that AcC″ (Tl^{207}) followed the AcK and separated from AcB (Pb^{211}). This separation has been studied in more detail and has permitted a method to be established for rapid preparation of sources of pure AcC″, free from carrier or salts. (tr-auth)

SORPTION PHENOMENA

3741

THE PEPTIZATION OF UX_1 BY VARIOUS METALLIC IONS: A POSSIBLE MECHANISM. I. Adler and J. Steigman. J. Phys. Chem. 57, 443-8(1953) Apr.

Desorption of radiocolloidal UX_1 (Th^{234}) from graphite by various metallic salts was studied in acid solution. With carrier-free UX_1 and low concentrations of desorbing agents, a high efficiency was noted with Th, Zr, and Hf salts (heavier members of the group IVa elements). Other compounds, including those of U(VI), Ce(IV), and Fe(III) showed much less desorbing ability at low concentrations, although their efficiency increases with increasing concentration. A third group, typified by Al, showed no desorbing ability at all. The observed specificity is ascribed to the tendency of certain ions to polymerize and form auto-complexes in acid solution. A mechanism of peptization is advanced which depends upon disruption of the gel by the formation of small heterocomplexes with the peptizing agents. The diffusion coefficient of UX_1 is shown to be almost doubled in the presence of added Th carrier. (auth)

3742

THE INTERACTION OF URANYL IONS WITH UX_1 (Th^{234}) IN ACID SOLUTION. I. Adler and J. Steigman. J. Phys. Chem. 57, 440-3(1953) Apr.

Studies were continued of the rate of adsorption of UX_1 (Th^{234}) from acid uranyl nitrate solutions by means of a carbon-coated dipping G-M tube. The appearance of a maximum in the curve was investigated. The effects of different acids, thickness of absorbent coating, and variation of temperature were examined. The maximum was shown to be due to the opposing processes of adsorption and desorption by uranyl salts. The effects of varying the uranyl concentration were studied. The appearance of a maximum was attributed to two irreversible consecutive reactions in a nonequilibrium process. The maximum amount of UX_1 adsorbed by a fixed thickness of adsorbent from an acid solution at a fixed uranyl to UX_1 ratio was shown to be approximately constant over an eightfold variation of uranyl salt concentration. (auth)

3743

SORPTION OF GASES AT VERY LOW PRESSURES BY THORIUM POWDER. S. Wagener. Proc. Phys. Soc. (London) B66, 400-13(1953) May 1.

The rate of sorption of Th powder for O and H is measured at pressures between 10^{-7} and 10^{-3} mm Hg as a function of temperature of the Th and of the period of exposure to gas. The sorbed quantities of gas are determined from the variation of rate of sorption with time. It is found that O is sorbed irreversibly, forming a stable oxide with a dissociation pressure which is immeasurably low. The activation energy of this chemisorption is ascertained from the increase of rate of sorption with temperature of the Th and is found to be about 0·75 kcal/mole. H is sorbed reversibly by a process of solution. The correlations between sorbed quantity of H, H pressure, and temperature of the Th are those to be expected for an equilibrium of solution. During dissolution of H heat is evolved and a value of about 13 kcal is found for this heat of solution. There are indications that at very low pressures most of the H in a tube containing Th powder is in the atomic state. The rate of sorption for H has a maximum value between 700 and 750°K. (auth)

SPECTROSCOPY

3744

EMISSION AND ABSORPTION L SPECTRA OF EUROPIUM AND TERBIUM. Paul Sakellaridis. Compt. rend. 236, 1547-9(1953) Apr. 20. (In French) (cf. NSA 7-2934 and 2935)

Experimentally determined L lines of the x-ray emission and absorption spectra of Eu and Tb are tabulated. (J.S.R.)

SYNTHESES

3745

Pittsburgh Univ.

PROGRESS LETTER FROM JANUARY 1, 1953 TO MARCH 31, 1953. Robert Levine, Thomas F. McGrath, and Carl Osuch. Issued Apr. 20, 1953. 6p. (NYO-3386)

Continuing the study of the synthesis of α-substituted β-diketones, the authors have synthesized, as starting materials, 2-ethyl-, 2-n-propyl-, 2-n-butyl-, 2-isobutyl-, and 2-t-amylpyridines from α-picoline by a modification of the Chichibabin reaction in which phenyllithium rather than Na amide is used to effect the alkylations. Yields for various conditions are given. Lithio 2-ethyl pyridine has been acylated with methyl benzoate and methyl acetate. From the former experiment a 68% yield of phenyl 2-(1-benzoyl)ethylpyridine was obtained while from the latter 52.4% of 2-(1-acetylethyl)pyridine and 39.4% of methyl bis(2-(1-ethyl)-pyridyl)carbinol were obtained. A start has also been made on the synthesis of 2,2′-dipyridylmethane for use as a chelating agent. It has been found that trifluoroacetophenone may be prepared in 55% yield by the very slow addition of an equivalent of phenyllithium to methyl trifluoroacetate, pointing the way to the synthesis of a large number of fluorinated ketones. (For preceding report in series see NYO-3383.) (G.Y.)

3746

A CONTRIBUTION TO THE TOTAL SYNTHESIS OF ALIZARIN; SYNTHESIS OF 1,2-DIHYDROXY-9,10-ANTHRAQUINONE-9-C^{14}. D. Lloyd Williams and Anthony R. Ronzio. J. Org. Chem. 18, 489-95(1953) May.

A new total synthesis of alizarin has been developed which gives excellent yields in all the steps in which isotopically labeled intermediates are involved. The new compound 4-(2-bromobenzyl)phenyl-2-tetrahydropyranyl ether was synthesized and then converted to carboxyl-labeled 2-(4-hydroxybenzyl)benzoic acid by the halogen-metal interconversion reaction with butyllithium and $C^{14}O_2$. Ring closure was accomplished by the use of liquid HF. Overall yield was 65.4% based on $BaC^{14}O_3$. Specific activity of the product was 1 mc per 90 mg. (G.Y.)

3747

A PREPARATION OF CARRIER-FREE Sb^{125} FROM NEUTRON IRRADIATED STANNOUS CHLORIDE. Joseph D. Robinson and Milton Kahn. J. Am. Chem. Soc. 75, 2004-6(1953) Apr.

A procedure for the separation of 2.7-yr Sb^{125} from solutions of irradiated stannous chloride employing deposition of the Sb from halide acid solution on metallic Cu without the use of external electromotive force is outlined. (J.E.D.)

3748

SYNTHESIS OF C^{14}-LABELED ACETYLENE AND ETHANE. N. P. Keĭer, B. V. Klimenok, and G. V. Isagulyants. Doklady Akad. Nauk S.S.S.R. 85, 1029-31(1952) Aug. 11. (In Russian)

Conversion of $BaC^{14}O_3$ to Ba carbide, from which labeled acetylene is obtained by the action of H_2O, is described. Labeled ethane is obtained by catalytic hydrogenation of the acetylene. (G.Y.)

URANIUM AND URANIUM COMPOUNDS

3749

THE TRINITRATOURANYL COMPLEX ION. C. C. Addison and N. Hodge. Nature 171, 569-70(1953) Mar. 28.

Production of salts of the type $M[UO_2{\cdot}(NO_3)_3]$, where M is mono-, di-, or triethylammonium, from U metal in liquid N_2O_4 is described. The reaction mechanism is discussed. (G.Y.)

ENGINEERING

3750

Lewis Flight Propulsion Lab., NACA

EFFECT OF HIGH BULK TEMPERATURES ON BOUNDARY LUBRICATION OF STEEL SURFACES BY SYNTHETIC FLUIDS. S. F. Murray, Robert L. Johnson, and Edmond E. Bisson. May 1953. 27p. (NACA-TN-2940)

An experimental study was made of the effect of high lubricant bulk temperatures on the boundary lubricating effectiveness with steel surfaces of various types of synthetic fluids considered as lubricants for turbine engines. Synthetic fluids were generally effective lubricants at higher temperatures than comparable petroleums. Lubrication with esters and possibly other fluids is believed to result from formation of a chemisorbed soap film by free acids (contaminants) in the fluid. Failure results from deterioration of metal soap and oxide films, which is influenced by temperature effects on the bulk fluid. Thermal stability can be associated with viscosity grade within a given class; however, no correlation could be made between lubrication failure temperature and the viscosity at failure temperatures for the various fluids. At temperatures up to its decomposition point, a silicate ester showed more promise than the other lubricants studied. (NACA)

AEROSOLS

3751

Los Alamos Scientific Lab.

PREPARATION OF AEROSOLS FOR ELECTRON MICROSCOPY. Ernest H. Kalmus. [1953]. 7p. (AECU-2533; LADC-1412)

A technique is described whereby fall-out particles from dust clouds, commonly called aerosols, may be prepared for observation with the electron microscope. Specimens are collected by means of various types of precipitators on molecular filters which are made from cellulose esters. During the process of dissolving this material in acetone, the particles adhering to the filter are transferred to the formvar-coated specimen screens of the electron microscope. Losses are negligible, residual filter background is eliminated and particles are clearly visualized for measuring. (auth)

HEAT TRANSFER AND FLUID FLOW

3752

Ames Lab.

THERMAL DIFFUSIVITY OF METALS AT HIGH TEMPERATURES. P. H. Sidles and G. C. Danielson. Mar. 1, 1953. 36p. (ISC-311)

A modified Ångström method for measuring thermal diffusivity and hence thermal conductivity of metals has been developed. Like previously reported dynamic methods, this method uses a heat source, whose temperature varies sinusoidally with time, located at one end of an effectively infinite rod. Unlike these methods, only one period of the heat pulse is required to eliminate the unknown coefficient determining the heat lost by radiation since both velocity and amplitude decrement of the heat pulse are measured. In addition to providing greater reliability at high temperatures by using only one period, the new method is faster in taking data and simpler in computation. The thermoelectric potentials from two thermojunctions are amplified and plotted on a recorder in order to obtain a permanent record of all necessary data for computing the thermal diffusivity. Results for Cu, Ni, and Th over the temperature range 0 to 500°C are given. (auth)

3753

HEATING OF A STATIONARY LAYER OF SPHERES BY FLOW OF HOT GAS. G. P. Ivantsov and B. Ya. Lyubov. Doklady Akad. Nauk S.S.S.R. 86, 293-6(1952) Sept. 11. (In Russian)

Mathematical expressions for solution of the problem are derived. (G.Y.)

MINERALOGY, METALLURGY, AND CERAMICS

3754

NONRADIOGENIC ISOTOPES IN GEOLOGY: A REVIEW. Earl Ingerson. Bull. Geol. Soc. Amer. 64, 301-73(1953) Mar.

An extensive, detailed review is presented on the relation of isotopic compositions of numerous elements to their geological origin, processes of isotopic fractionation in nature, and geological problems to which stable isotopes may be applied. ~250 references. (G.Y.)

CERAMICS AND REFRACTORIES

3755

Ames Lab.

SINTERING MECHANISM AS APPLIED TO REFRACTORY OXIDES: A BIBLIOGRAPHY, 1937–1952. D. R. Wilder. Dec. 1, 1952. 27p. (ISC-288)

This bibliography was prepared as a guide to the literature from 1937 to 1952 pertaining to sintering of refractory oxides. Theories proposed for the mechanism of sintering, work on which these theories are based, and reviews of powder metallurgy theories of sintering are included. (C.H.)

3756

New Jersey Ceramic Research Station, Rutgers Univ.

PROGRESS REPORT FROM MARCH 1 TO JUNE 1, 1952. N. H. Snyder, E. J. Smoke, H. R. Wisely, Edwin Ruh, H. L. Bauer, G. J. Waiver, A. V. Illyn, S. W. Niemczura, and D. R. Robinson. 98p. (NP-4545; Progress Report 6)

Progress is reported on the development of ceramic bodies with high thermal conductivity, high thermal shock ceramics, development of dense cordierite bodies, development of ceramics free of electrolytes, and ultra low-loss ceramics. (J.S.R.)

GEOLOGY AND MINERALOGY

3757

Brookhaven National Lab.

EFFECTS OF A PRIMEVAL ENDOWMENT OF U^{236}. David B. Rosenblatt. [1952]. 8p. (BNL-1363)

The effects of a primeval endowment of U^{236} upon theories pertaining to the evolution of the elements, the thermal history of the earth, and geochronology are considered. (auth)

3758

Columbia Univ.

COLLOIDAL CHARACTERISTICS AND BEHAVIOR OF SOME FLORIDA PHOSPHATE SLIMES; PROGRESS REPORT FOR JULY 1, 1952–NOVEMBER 30, 1952. Victor K. La Mer and Robert H. Smellie, Jr. Issued Mar. 19, 1953. 25p. (NYO-3287)

Data on the flocculation, subsidence, and filtration of slimes has been extended beyond that reported in NYO-3286. The dependence of rates of subsidence and filtration on the amount of added potato starch are considered from the standpoint of whether a subsidence or a filtration process is to be used in dewatering. The addition of the multicharged anion, ferrocyanide, markedly improves the action of starch in respect to the filtration rate of certain slimes. Preliminary results using polyelectrolytes of the "Krilium" type indicate that these compounds are more effective on a weight basis than starch in enhancing the rate of filtration. A new empirical equation for presenting subsidence data in linear form has been established as valid for different slimes and conditions. The beneficiation of U-rich fractions is again considered with respect to some new experiments in progress. (G.Y.)

3759

Pennsylvania State Coll. School of Mineral Industries

AN INVESTIGATION OF THE MINERALOGY AND PETROGRAPHY OF URANIUM-BEARING SHALES: QUARTERLY PROGRESS REPORT [FOR] PERIOD APRIL 1–JUNE 30, 1952. Thomas F. Bates, Harold D. Wright, Charles E. Weaver, Bruce Nelson, and Erwin Strahl. June 23, 1952. 17p. (NYO-3358)

Work on the clay mineralogy of the Chattanooga bentonite has been essentially completed. The bentonite consists of two types of clay minerals. The 2:1 clay minerals appear to be the result of leaching and hydration of muscovite. A 1:1 kaolin type clay mineral is apparently the result of alteration of volcanic glass and in part of muscovite. True illite and montmorillonite appear to be very minor constituents of the bentonite. The heavy minerals support the idea that the bentonite is an altered volcanic ash. The pyrite nodules contain three types of clay mineral. One appears to be similar to the 2:1 non-expanded illite type clay mineral found in the bulk shale. A second type of 2:1 mineral is partially expanded and appears to be characteristic of the pyrite nodule. The exact nature of this expanded 2:1 mineral remains to be determined when additional material is available for study. A kaolinite clay mineral occurs in the finest clay fractions and seems to be peculiar to the pyrite. It also appears that the high U counts of the pyrite nodules do not result from U ions adsorbed on the clay minerals by base exchange phenomena. Techniques for the quantitative mineralogical analysis of the shale continue to be tested and improved. In addition new methods for the analysis of some constituents are being developed. Spectrographic data on the elemental constituents of the shale are available and can be compared with the U content. Nuclear emulsions and stripping films have been utilized to detect the source of α-particle radiation in the shale samples. Regenerated humic acids and bitumen characteristic of the organic material found in the shale have been extracted and categorized by their infrared absorption curves. Metallographic examination of polished sections of the shale has provided pertinent and significant data on the paragenesis of the pyrite and marcasite. (For previous report in this series see NYO-3357.) (auth)

3760

Amherst Coll.

ANNUAL REPORT FOR JULY 1, 1952 TO JUNE 30, 1953. George W. Bain. Mar. 1953. 10p. (RME-3039)

Experimental simulation of uranyl salt mineral deposits was undertaken, first, to disclose those stages of mineralization intermediate between suitable host rock and rich mineral occurrences, and second, to identify thereby the minimum number of processes which must occur in conjunction in order to form a U producer. The laboratory reproduction of various phases of mineralization has been suggested by and coordinated with occurrences observed in the field. Work to date shows that all important U deposits on the Colorado Plateau are due to four features occurring in conjunction. The first is existence of a U source, the second is the accumulation of a suitable ore host, the third is a controlled groundwater movement through the source to the host, and the fourth is a suitable precipitant in the host to fix the U of any origin at one place. The usual source is a uraniferous leptothermal jasperoid deposit which became eroded and had its fragments distributed in stream channel accumulations. The usual host is a fluviatile gravel or sand or deposits immediately adjacent thereto. A groundwater movement has occurred at many times and principally in the synclines formed during the Laramide and Oligocene age disturbances which thereby become the apparent age of the deposits. The U from all areas traversed by the groundwater is leached in some degree and is precipitated in carbonate, vanadium, and sulfide-rich hosts which deplete the SO_4 content of the water. (cf. RMO-44, -66, and -982.) (auth)

3761

Columbia Univ.

FRACTURE STUDIES IN THE ZUNI AND LUCERO UPLIFTS, NEW MEXICO, PART 1; ANNUAL REPORT FOR JUNE 15, 1952 TO APRIL 1, 1953. Walter H. Bucher. 12p. (RME-3042)

A study is made of the fracture systems in the Zuni and Lucero uplifts, their geometric and time relation to regional and local structures and igneous rock bodies, and their possible mechanical interpretation. (J.E.D.)

3762

Division of Raw Materials, AEC

AIRBORNE RADIOMETRIC SURVEY OF THE EAST FLANK OF THE BIG HORN MOUNTAINS, WYOMING AND MONTANA. E. E. Jones. Issued Sept. 26, 1952. 9p. (RME-4006)

An airborne radiometric survey of parts of the east flank of the Big Horn Mountains was completed. An area of approximately 250 square miles was covered, and only two anomalies were found in the entire area. Flight lines were arranged in accordance with the geology of the area, particular attention being given to formations the stratigraphic equivalents of which are known to be U-bearing in other areas. Two additional zones of radioactivity were found by ground investigation, but assays from both the ground and the airborne discoveries showed no economic U deposits. (auth)

3763

Amherst Coll.

URANIUM DEPOSITS IN SOUTHWESTERN COLORADO PLATEAU. George W. Bain. Issued Aug. 1952. 52p. (RMO-982(Rev.))

The southwestern part of the Colorado Plateau province was studied to test results from experimental simulation of Colorado Plateau type U deposits and to search out additional agents influencing U precipitation which might be investigated experimentally. The sedimentation pattern of the Shinarump formation conforms more closely to that produced in the experimental arrangements than to traditional areal descriptions of this formation. The rich ore occurrences likewise conform to the laboratory indications; however, U seemed to be precipitated by both phosphate and cuprous sulfide as well as by calcite and V oxide and effect of these needs to be tested in the laboratory. The Shinarump formation is thin or absent on both margin and center of the basin; the thickest part along the south side of the basin, is in and above the midcourse of the northwardtrending channels at about the Arizona–Utah line. Almost all U is in a jasperoid conglomerate in the lowest part of the channels and all U above this conglomerate has been introduced by groundwater. The pebbles of this lower conglomerate decrease progressively in size and improve in sphericity in occurrences located down-channel. Mudstone deltas appear near the base of many channels in the thick Shinarump section. No significant U has been found down-channel from these deltas. The mineralogical character of deposits can be zoned into an eastern V-excessive zone, a central V-sufficient zone, and a western and southern V-deficient zone. The V-deficient zone corresponds approximately to the area overlain by sandy phases of the Mancos "shale." U fixation in the V-deficient zone is by phosphates to form autunite and torbernite or by cuprous sulfides to make uraninite. The mines and prospects of the area are described. (auth)

3764
Geological Survey
PRACTICES AND RESULTS OBTAINED WITH SAMPLE COLLECTORS FOR WAGON-DRILL CUTTINGS. E. D. Gordon, C. F. Withington, and V. T. Dow. Jan. 1953. 23p. (TEI-213)

The U. S. Geological Survey has experimented with wagon drilling as a low-cost method of subsurface exploration on the Colorado Plateau. The wagon drill is a percussion-type drill mounted on a truck or half-track. Compressed air is used to operate the drill and to blow the cuttings from the hole. For the collection of the cuttings, three sample collectors designated as Machines A, B, and C were tested. Two units of Machine A, which is actuated by a motor-driven, vacuum-type fan, were extensively tested for about 6 months. Under the field operating conditions, sample recovery averaged about 67%. Initial cost for each unit was $722.61, and repair cost for each was $141. Machine B was tested during a 2-month period. Sample recovery averaged 91%; initial cost was $481.20 and repair cost was negligible. Machine C was tested for 4 months. Sample recovery averaged 96%; initial cost was $373.87 and repair cost was negligible. Continuous samples were collected by each machine, and geologic logs were made from examination of these samples. All samples that contained mineralized material as indicated by visual estimate or γ-ray log were assayed. Assay returns of cuttings collected from wagon-drill holes showed a close correlation with those of collected core samples from diamond drilling. (auth)

3765
Geological Survey
GEOLOGY OF THE COPPER KING MINE AREA, PRAIRIE DIVIDE, LARIMER COUNTY, COLORADO. Paul K. Sims and George Phair. Dec. 1952. 49p. (TEI-311(pt.1))

The Copper King mine, in Larimer County, in the northern part of the Front Range of Colorado, was operated for a short time prior to World War II for Cu and Zn; but since 1949, when pitchblende was discovered on the mine dump, it has been worked for U. The two types of mineral deposits in the mine area—massive sulfide and pitchblende deposits—are of widely different mineralogy, age, and origin. The massive sulfide deposits are small and consist of pyrite, sphalerite, chalcopyrite, pyrrhotite, and in places magnetite in amphibole skarn, mica sköis, and quartzite. The deposit at the Copper King mine has yielded small quantities of high-grade sphalerite ore. The massive sulfides are pre-Cambrian pyrometasomatic deposits. The pitchblende at the Copper King mine is principally in the Copper King vein, a tight, hard breccia zone that cuts through both granite and the massive sulfide deposit. A small part of the pitchblende is in small fractures near the vein and in boxwork pyrite adjacent to the vein; the post-ore faults, close to their intersection with the Copper King vein, contain some radioactive material; but elsewhere, so far as known, they are barren. The pitchblende in the deposit forms a steeply plunging ore shoot that has a horizontal length of more than 50 feet and a vertical height of about 85 feet. The thickness of the ore shoot averages about 2 feet, but it ranges from a featheredge to about 4 feet. The hard pitchblende is intimately intergrown with siderite; other gangue minerals include pyrite, quartz, and finely comminuted fragments of the wall rocks. The vein was repeatedly reopened during mineral deposition, as shown by several stages of brecciation and recementation by the vein matter. The pitchblende deposit probably formed at intermediate temperatures and depths and, according to the Pb/U ratio, is about 60 million years old (early Tertiary). (auth)

3766
Geological Survey
TECTONIC MAP OF THE COLORADO PLATEAU. R. G. Luedke and E. M. Shoemaker. 1952. and STRUCTURAL SETTING OF THE COLORADO PLATEAU. E. M. Shoemaker. Mar. 1953. 3p. (TEM-301)

Major tectonic features of the Colorado Plateau are presented on a map and are discussed briefly. An outline of the probable sequence of Cenozoic structural events is included. (C.H.)

3767
FIRST EXPERIMENTS ON APPLICATION OF ARGON METHOD TO DETERMINATION OF AGES OF MINERALS. E. K. Gerling, G. M. Ermolin, N. V. Baranovskaya, and N. E. Titov. Doklady Akad. Nauk S.S.S.R. 86, 593-6(1952) Sept. 21. (In Russian)

The K-capture decay of K^{40} to A^{40} is shown to be suitable for determination of the absolute ages of minerals. The ages of several amazonites, nordmarkites, lepidolites, and microclines determined by this method are listed. (G.Y.)

3768
THE DETERMINATION OF GEOLOGICAL AGE BY MEANS OF RADIOACTIVITY. S. C. Curran. Quart. Revs. (London) 7, 1-18(1953).

A review. 30 references. (G.Y.)

3769
DETERMINATION OF THE CHARACTERISTICS OF SEDIMENTATION OF THE PHOSPHATE LEVELS AND THEIR RELATION WITH THE RADIOACTIVITY IN THE DEPOSIT OF OULED ABDOUN (CENTRAL MOROCCO). Charles Bizard. Compt. rend. 236, 1587-9(1953) Apr. 20. (In French)

The U is concentrated preferably in the levels of homogeneous phosphate sands, of a relatively small thickness. There exist some regions in the basin where more highly radioactive zones overlap. The changes of thickness of the beds, as well as the lateral variations of the contents in U and $Ca_3(PO_4)_2$, are the more evident, the older the levels. (tr-auth)

3770

VERTICAL DISTRIBUTION OF RADIUM IN DEEP-SEA SEDIMENTS. Viktor St. Kröll. Nature 171, 742(1953) Apr. 25.

Unexpected variations in Ra concentration in deep-sea sediments are attributed to migration of Ra following its production by decay of Io(Th^{230}) deposited from the sea water. There appears to be a surplus of Ra over that to be expected from Io precipitation; this may be due to a higher U content in the oceans during late quaternary time than at present. (G.Y.)

3771

SPONTANEOUS FISSION OF TERRESTRIAL URANIUM. C. Festa and M. Santangelo. Ann. geofis. (Rome) 5, 551-60(1952) Oct. (In Italian)

A rough determination of the Kr and Xe generated by the spontaneous fission of terrestrial U during the last 3.3 billion yr (earth's age) is attempted. The calculations are based on the most recent data for the spontaneous-fission mean life of U^{238}. From a comparison between the abundances of each isotope in the atmospheric Kr and Xe and the abundances of the same isotope in the fission Kr and Xe, it can be estimated that the contribution of the spontaneous fission of U^{238} to the production of the atmospheric Kr and Xe is negligible. The fission Kr and Xe and the Kr and Xe content in the earth's crust (calculated by Brown's method) are also compared. The spontaneous fission of U seems not negligible in this case. The great interest of the determination of the Kr and Xe content in rocks and natural gases and its isotopic composition is discussed. (auth)

3772

STUDY OF THE RADIOACTIVITY IN MT. ETNA LAVAS BY THE NUCLEAR EMULSION METHOD. L. Barbera, M. Curatolo, M. M. Indovina Addario, and M. Santangelo. Ann. geofis. (Rome) 5, 603-11(1952) Oct. (In Italian)

Some preliminary results on the radioactivity of Mt. Etna lavas are given. The authors conclude that the average total activity of these lavas does not change with the data of the eruption and is equal to 5×10^{-4} to 6×10^{-4} $\alpha/cm^2/sec$. (auth)

3773

THE GEOCHEMISTRY OF THE STABLE CARBON ISOTOPES. Harmon Craig. Geochim. et Cosmochim. Acta 3, 53-92 (1953) Feb. (In English)

Several hundred samples of C from various geologic sources have been analyzed in a new survey of the variation of the ratio C^{13}/C^{12} in nature. Mass-spectrometric determinations were made on the instruments developed by Urey and his coworkers utilizing two complete feed systems with magnetic switching to determine small differences in isotope ratios between samples and a standard gas. With this procedure variations of the ratio C^{13}/C^{12} can be determined with an accuracy of ±0.01% of the ratio. The results confirm previous work with a few exceptions. The range of variation in the ratio is 4.5%. Terrestrial organic C and carbonate rocks constitute two well-defined groups, the carbonates being richer in C^{13} by some 2%. Marine organic C lies in a range intermediate between these groups. Atmospheric CO_2 is richer in C^{13} than was formerly believed. Fossil wood, coal, and limestones show no correlation of C^{13}/C^{12} ratio with age. If petroleum is of marine organic origin, a considerable change in isotopic composition has probably occurred. Such a change seems to have occurred in C from black shales and carbonaceous schists. Samples of graphites, diamonds, igneous rocks, and gases from Yellowstone Park have been analyzed. The origin of graphite cannot be determined from C^{13}/C^{12} ratios. The terrestrial distribution of C isotopes between igneous rocks and sediments is discussed with reference to the available meteoritic determinations. Isotopic fractionation between iron carbide and graphite in meteorites may indicate the mechanism by which early fractionation between deep-seated and surface terrestrial C may have occurred. (auth)

METALS AND METALLURGY

3774

Institute of Engineering Research, Univ. of Calif., Berkeley CONTRIBUTION OF d-LEVEL ELECTRONS TO THE PLASTIC PROPERTIES OF NICKEL ALLOYS: TECHNICAL REPORT. Victor F. Zackay, Thomas H. Hazlett, and Earl R. Parker. Apr. 1953. 14p. (AECU-2523; Technical Report 11)

An attempt was made to evaluate the role played by d-level electrons in determining the plastic properties of alloys. Studies are reported for the Ni-Fe and the Ni-Co systems. Physical and chemical properties of Fe, Co, and Ni, and the chemical compositions of the alloys used, are summarized in tabular form. Experimental data are presented showing a discontinuity in the elastic modulus occurring at the Curie temperature in Ni, stress-strain curves determined for pure Ni and for each of the alloys at room temperature and at 700°C, creep curves for each of the alloys, variations in the lattice parameters with alloy content, effects of alloying on the electrical resistivity of pure Ni, and the tensile properties of pure Ni from 25 to 700°C. From an analysis of the data it was concluded that the d-level electrons exert only a small effect on the plastic properties of these alloys. (C.H.)

3775

[Brush Beryllium Co.] APPLICATION OF VIBRATIONS TO MOLTEN METALS: A REVIEW OF THE LITERATURE. R. G. O'Rourke. [1951]. 7p. (AECU-2535)

A survey is made of work on sonic and supersonic vibrations as applied to molten metals, and of their effects on grain size, melting point, homogeneity, etc. 19 references. (J.S.R.)

3776

Wisconsin Univ. RESEARCH ON ELECTRODEPOSITION OF MOLYBDENUM ALLOYS FROM AQUEOUS SOLUTIONS; PROGRESS REPORT [FOR] NOVEMBER 1, 1952 TO JANUARY 31, 1953. D. W. Ernst and R. F. Amlie. Feb. 7, 1953. 14p. (NP-4549; Progress Report 4)

Methods of statistical analysis were applied unsuccessfully to see if the current efficiency of the Ni-Mo plating bath could be predicted. The best reagent for controlling the pH of the bath was NH_4OH. Na^+ and NH_4^+ were found to be necessary constituents of the plating bath. Neither cathode current efficiency nor alloy composition was affected by heating the bath, allowing it to stand, or both. The Hull cell was used in the initial investigation of Co-Mo plating baths. The effects of various complexing agents, bath pH, and Na_2MoO_4 concentration was studied. (J.S.R.)

3777

Institute of Engineering Research, Univ. of Calif., Berkeley SOME OBSERVATIONS ON THE WORK HARDENING OF METALS; FUNDAMENTAL STUDIES RELATED TO THE ORIGIN AND NATURE OF CREEP OF METALS. E. H. Edwards, Jack Washburn, and Earl R. Parker. Apr. 1953. 22p. (NP-4554; Technical Report 8)

A study of single Cd, Cu, and Zn crystals tested in simple shear and of stress-induced movement of dislocation boundaries has lead to the following conclusions on the nature of work hardening: (1) the movement of dislocations through a crystal is impeded by internal barriers, even during simple shear; (2) duplex slip in single crystals and the more complex deformation in polycrystalline specimens are accompanied by a progressive formation of dislocation boundaries which act as barriers in the path of moving dislocations; (3) stress-induced movement of dislocation boundaries leads to union of adjacent boundaries and increased effectiveness in blocking movement of active dislocations. (auth)

3778

Battelle Memorial Inst.

THE INVESTIGATION OF ZIRCONIUM-CERIUM MASTER ALLOYS FOR USE IN ADDING ZIRCONIUM TO MAGNESIUM; FINAL REPORT [COVERING PERIOD] APRIL 1, 1952—DECEMBER 31, 1952. M. W. Mote, P. D. Frost, and J. H. Jackson. Jan. 31, 1953. 20p. (NP-4567)

It was demonstrated that up to 0.70% Zr could be introduced into Mg alloys by the use of Zr-Ce master alloys. Zr-Ce alloys were made in a cold-crucible, W-electrode, inert-atmosphere arc furnace and contained from 10 to 70% Zr. Experimental Mg alloys were made with intended compositions of 6% Zn, 0.7% Zr, and 0.5, 1.0, and 1.5% Ce. None of the alloys had the intended compositions. This result was attributed to the fact that stirring was kept to a minimum and a long settling period was used to avoid dross inclusions. Data are included on the melting, casting, extrusion, and mechanical properties of the experimental alloys. (C.H.)

3779

Carnegie Inst. of Tech.

PROGRESS REPORT [FOR] JANUARY—MARCH 1953. R. Smoluchowski, C. Coleman, L. Couling, S. Hayes, C. W. Haynes, and Y. Y. Li. May 15, 1953. 6p. (NYO-3485)

Brief descriptions are given of a reproducible etching technique for the study of grain-boundary diffusion in Al-Cu system, a high-intensity, low-temperature, small-angle x-ray scattering camera, a study of the influence of grain orientation on grain-boundary self-diffusion in body-centered Fe-Si lattice, and a study of anisotropy of diffusion of Ag in bi-crystals of Cu. Results confirm the previously proposed model of grain boundaries. Small-angle x-ray scattering in cold-worked and annealed Cu indicates an appreciable clustering of imperfections during anneal. (For preceding period see NYO-3484.) (L.M.T.)

3780

Arcos Corp.

THE WELDING OF TYPE 347 STEELS: TECHNICAL REPORT ON THE EFFECT OF VARIOUS HEAT TREATMENTS ON THE TENSILE PROPERTIES OF MODIFIED TYPE 347 WELD DEPOSITS. [Lorin K. Poole]. [May 12, 1953]. 30p. (NYO-3496)

The effect of various isothermal heat treatments on the 0.505 tensile properties of a standard Type 347 weld deposit and five modifications were studied. The highest strengths and lowest elongations were obtained after a 100-hr heat treatment at 1300°F. The lowest strengths and highest ductility were seen after a 1950°F heat treatment. One composition which contains low C and has a fully austenitic microstructure shows severe tendencies to fissure after heat treatment. There was not sufficient difference between the values obtained to determine which composition may be the least susceptible to loss of ductility on exposure to elevated temperature. (auth)

3781

Massachusetts Inst. of Tech.

MEASUREMENT OF STACKING FAULTS IN COLD WORKED ALPHA BRASS. B. E. Warren and E. P. Warekois. Apr. 15, 1953. 5p. (NYO-3733)

Filings of 70-30 brass were pressed into flat briquets and reflections were recorded on a Norelco spectrometer using Co K_α x rays. To minimize positioning errors of the sample, all peaks were recorded on a single run, and measurements were made only of the distance between the centers of gravity of the neighboring lines (111)—(200) and (222)—(400). Measured peak separations for a cold-worked sample given subsequent 1-hr anneals at various temperatures are shown. The effect of cold work in the sample is to decrease the (111)—(200) separation by 0.15° and to increase the (222)—(400) separation by about 0.34°. On the average there is a stacking fault once every 40 (111) planes. (G.Y.)

3782

Rensselaer Polytechnic Inst.

THERMAL CYCLES ASSOCIATED WITH THE ARC WELDING OF ½-INCH TITANIUM PLATE; SUMMARY TECHNICAL REPORT. Ernest F. Nippes, John M. Gerken, Bernard W. Schaaf, and Edward C. Nelson. Mar. 1953. 66p. (WAL-401/95-12a; Summary Technical Report 1)

Thermal cycles were determined for points adjacent to arc welds in ½-in. Ti plate at energy inputs of 20 to 50 kilojoules/in. Cooling curves were derived for points along Jominy bars end-quenched from 1500 and 1600°F so that, in future work on Ti alloys, hardnesses and microstructures adjacent to arc welds may be correlated with those at points of equal cooling rates along Jominy bars, provided that the betanizing temperatures are the same in both the weld and Jominy bar. The effect of cooling rate on the lowering of the transformation range was investigated for commercially pure Ti and an Fe-Cr Ti alloy. This study indicated that the transformation range of the commercially pure Ti was not materially lowered by cooling rates of the magnitude usually found adjacent to welds. However, these same cooling rates lowered the transformation range of the Fe-Cr alloy about 400°F below the equilibrium α-β transformation temperature range. For butt welds in commercially pure Ti, Charpy impact values for the weld metal were much lower than those for the heat-affected zone or base plate. However, a heat treatment at 1200°F for 24 hr greatly improved the impact strength of the weld metal and moderately improved that of the heat-affected zone. (auth)

3783

Battelle Memorial Inst.

THE WELDING OF BETA-STABILIZED TITANIUM ALLOYS; SUMMARY REPORT. G. E. Faulkner, G. B. Grable, and C. B. Voldrich. Jan. 30, 1953. 64p. (WAL-401/97-18)

To determine the effects of the principal β-stabilizing elements on weld-joint properties in Ti alloys, four series of alloys containing the elements, Fe, Mn, Cr, and Mo were arc-melted and fabricated to ⅛-, ¼-, and ½-in. plates. Single-vee butt-joint welds were made in the plates using a water-cooled tungsten-arc torch in a He-filled welding chamber. The welds were tested in the as-welded condition and after postweld heat treatments. The tests used to evaluate the welded joints consisted of joint tensile tests, longitudinal and transverse bend tests, notch-toughness tests, and aging tests. Hardness studies and microstructural examinations were made also on the welded joints. (auth)

3784

New York Univ. Coll. of Engineering

MECHANISM OF MARTENSITIC TRANSFORMATION OF TITANIUM ALLOYS; INTERIM TECHNICAL REPORT. Y. C. Liu. Mar. 23, 1953. 38p. (WAL-401/88-23; Interim Technical Report 1)

Quenched specimens, containing 10 to 11% Mo, 6% Cr, or 3.3 to 5.5% Fe, of the respective Ti binary alloy systems were studied, and habit planes of martensites induced by subzero treatment (−187°C) in the Ti-Mo and Ti-Cr systems and by deformation in the Ti-Mo alloys were investigated. Two habit planes, $\{334\}_\beta$ and $\{344\}_\beta$, were found in the water-quenched Ti-Mo specimens. Martensite induced either by subzero treatment or by deformation had only one habit plane, $\{344\}_\beta$. The occurrence of two habit planes in this alloy is explained on the basis of a temperature dependency. In both the Ti-Cr and Ti-Fe alloys, the $\{334\}_\beta$ plane was found to be the martensite habit plane in the water-quenched specimens. Subzero treatment of Ti-Cr alloys did not change the martensite habit plane found in water-quenched specimens. (auth)

3785

SOME PROBLEMS OF THE THEORY OF CREEP. Y. N. Rabotnov. Translated by S. Reiss from Vestnik Moskov. Univ., No. 10, 81-91(1948). 19p. (NACA-TM-1353)

A theory of creep is proposed which represents an extension of the theory of elastic heredity of Volterra to plastic deformation. The theory is applied to the problems of relaxation, reverse creep, creep bending of bars, and creep of a pipe under internal pressure. A special class of three-dimensional problems, in which the relative magnitudes of the stresses at a point remain constant with time, and likewise the relative magnitudes of the strains, is also considered. (NACA)

3786

SYSTEM OF ATOMIC RADII OF METALS. G. B. Bokiĭ. Doklady Akad. Nauk S.S.S.R. 89, 459-62(1953) Mar. 21. (In Russian)

Ionic radii of the metals from Li to Np have been calculated, consideration being taken of coordination number and phase changes. (G.Y.)

3787

THERMAL FATIGUE OF ALUMINUM MONOCRYSTALS. V. I. Arkharov, S. G. Ignat'eva and Yu. D. Kozmanov. Doklady Akad. Nauk S.S.S.R. 88, 439-40(1953) Jan. 21. (In Russian)

Pure (99.7%) Al single crystals were cycled between 300, 400, or 500°C and 15°C. Effects of temperature gradient and number of cycles on plastic deformability are described briefly. (G.Y.)

3788

PREPARATION OF SINGLE CRYSTALS OF TITANIUM AND THEIR MODE OF DEFORMATION. A. T. Churchman. Nature 171, 706(1953) Apr. 18.

Single crystals up to 20 × 2.5 × 1 mm were prepared in pure Ti by a modified strain-anneal technique. Grain growth, slip planes, and deformation twinning were investigated with tensile tests. (G.Y.)

TRACER APPLICATIONS

3789

DETERMINATION OF THE AGE OF LEPIDOLITES BY THE METHOD OF ISOTOPE DILUTION. G. L. Davis and L. T. Aldrich. Bull. Geol. Soc. Amer. 64, 379-80 (1953) Mar.

Using "spike" samples of Sr and Rb of abnormal isotopic abundance, the authors have determined, by isotopic dilution, the ages of four lepidolites from Calif., S. Dak., Manitoba, and S. Rhodesia to be 147 ± 5, 2000 ± 20, 3360 ± 100, and 3160 ± 100 million years, respectively. Certain of these values differ substantially from those reported previously. (G.Y.)

PHYSICS

3790

Argonne National Lab.

PHYSICS DIVISION SUMMARY REPORT [FOR] JUNE THROUGH NOVEMBER 1952. Mar. 1953. 69p. (ANL-4982)

A method is described for measuring the neutron-capture cross section of H, found to be 0.329 ± 0.004 b at 2200 m/sec. Measurements of neutron total cross sections of 21 elements were obtained by observing proton recoils from neutrons in an anthracene crystal with and without the various elements as absorbers. The following neutron cross sections were determined by means of the annular scattering counter: (1) the self-detection cross section of Bi, (2) scattering cross sections for B^{10}, Sc^{45}, Pb, Bi, Hf, Hf^{177}, and Hf^{178}, (3) total cross sections of B^{10}, Sc^{45}, and Gd, and (4) absorption cross sections (sub-Cd) of B^{10} and Sc^{45}. The neutron transmission of Gd and Cd were measured with the fast chopper. Neutron resonances in Mo^{95}, Mo^{96}, and Mo^{97} are reported. An attempt to use the liquid scintillation neutron detector as the detecting system for the fast chopper is described. The results of neutron-capture γ spectra studies obtained to date are summarized. A decay scheme is presented for Rh^{104}. An experiment to accurately determine the energy of Sb-Be photoneutrons is described. The average charges of the product atoms after isomeric transition of 4.4-hr Br^{80m} and of K^{41} atoms after β decay of A^{41} were redetermined. Half lives of Eu^{152}, Eu^{154}, and Sm^{151} were measured. The heat of vaporization of C was measured. Some of the interesting features of the Fe^{56} neutron-capture cross section are discussed. (For preceding period see ANL-4963.) (L.M.T.)

3791

Brookhaven National Lab.

QUARTERLY PROGRESS REPORT [FOR] OCTOBER 1 – DECEMBER 31, 1952, UNCLASSIFIED SECTION. 56p. (BNL-219)

The abstracts of papers published during this quarter by the various departments are presented. Brief descriptions are presented of a 100-channel time-of-flight analyzer, a "pulse-stretcher" circuit, and a gas-tube counter circuit. Initial surveys of radiation levels about the Cosmotron are reported. Some of the final test results of the Cosmotron and its related instrumentation are reported. A new neutron spectrometer is briefly described. A method is reported for obtaining I^{132} from $Te^{132}O_2$. Further progress is reported on the polymerization of styrene and methyl methacrylate and on waste disposal by use of montmorillonite clays. An apparatus which will be used for heat-transfer studies of liquid metals is described. Progress reported in biology includes: (1) effects of x rays on "wet" and "dry" barley seeds, (2) mutation rate for specific characters in corn grown in a γ field, (3) radiation effects on plant physiology of gladioli, and (4) effects of x radiation on hypophysectomized rats. (For preceding period see BNL-209.) (L.M.T.)

3792

Oak Ridge National Lab.

SURVEY OF ULTRASONICS. Mary E. Lee. Feb. 12, 1953. 4p. (CF-53-2-138)

A bibliography of 10 references to ultrasonics is compiled from Chemical Abstracts. The abstracts are given. (J.S.R.)

3793

Ames Lab.

CONDUCTIVITY OF THIN FILMS IN A LONGITUDINAL MAGNETIC FIELD. Ernest Koenigsberg. [Feb. 15, 1953]. 6p. (ISC-317)

Chambers (Proc. Roy. Soc. (London) A202, 378(1950)) evaluated the electric conductivity of thin metal wires in longitudinal magnetic fields by using geometric arguments. This note uses similar arguments in evaluating the conductivity of thin metal films in a longitudinal field. (L.M.T.)

3794

CHANGE IN THE VOLUME OF TIN ON SUPERCONDUCTING TRANSITION IN THE MAGNETIC FIELD. B. G. Lazarev and A. I. Studovtsov. Translated from Doklady Akad. Nauk S.S.S.R. 69, 345-7(1949). 5p. (AEC-TR-1398)

The change in the volume of Sn during the superconductive transition has been measured as 9.1×10^{-8}, in agreement with the calculated value. (J.S.R.)

3795

THEORY OF ELEMENTARY PARTICLES; CONSERVATION OF NUCLEAR CHARGE AND A POSSIBLE NEW TYPE OF V PARTICLE. Ya. B. Zel'dovich. Doklady Akad. Nauk S.S.S.R. 86, 505-8(1952) Sept. 21. (In Russian)

A hypothesis of nuclear charge is proposed that permits simple formulation of the impossibility of annihilation of nucleons. Together with the known neutral V particle, decaying with proton emission, an anti-V particle is shown probably to exist and to decay with emission of an antiproton, regardless of the spin (integral or half) of the V particle. (G.Y.)

3796

TEMPERATURE DEPENDENCE OF THE SURFACE TENSION OF BISMUTH AND ITS ALLOYS WITH SODIUM AND POTASSIUM. P. P. Pugachevich and I. P. Altynov. Doklady Akad. Nauk S.S.S.R. 86, 117-19(1952) Sept. 1. (In Russian)

The unique apparatus employed is described, and graphs of the surface tension from 270 to 500°C of pure Bi, of Bi-Na alloys containing up to 0.664 at. % Na, and of Bi-K alloys containing up to 0.025 at.% K are presented. (G.Y.)

3797

MEASUREMENT OF SPECIFIC HEAT OF METALS AT EXTREMELY LOW TEMPERATURES (CADMIUM FROM 0.3 TO 0.9°K). B. N. Samoĭlov. Doklady Akad. Nauk. S.S.S.R. 86, 281-4(1952) Sept. 11.

A special calorimeter is described, and specific heat data are graphed. (G.Y.)

3798

A COURSE IN RADIOACTIVE DETERMINATIONS. Robert H. McFarland and Richard E. Hein. Am. J. Phys. 21, 325-30(1953) May.

The lecture-laboratory course in the use of radioactive isotopes which has been given at Kansas State College since 1950 is described. (L.M.T.)

AEROSOLS

3799

Princeton Univ.

ELECTRON MICROSCOPY AND DIFFRACTION OF AEROSOLS FORMED IN D. C. ELECTRIC ARC. James Amick and John Turkevich. Apr. 1, 1953. 60p. (NYO-3429)

The report deals with the first phase of a systematic investigation of the morphology, composition, particle-size distribution, and nature of aggregation of the metal and metal-oxide aerosols produced in a d-c arc. Aerosols of 22 elements were examined in an electron microscope having a resolution of better than 25 A. The chemical composition of these same aerosols was identified by electron diffraction. Differences in morphology of the aerosols from each element were observed, sufficient to justify the hope that identification by the shape, size, and character of aggregation of the aerosol could be made from the electron photomicrographs. (auth)

COSMIC RADIATION

3800

THE DENSITY DISTRIBUTION WITHIN TWO METERS OF LARGE AIR SHOWER AXES. R. E. Heineman and W. E. Hazen. Phys. Rev. 90, 496-7(1953) May 1.

Details of the lateral structure of individual air showers were observed by using a 20-channel electron-pulse ionization chamber which took 20 density samples from each shower. The pulses were separately amplified, displayed on 20 cathode-ray tubes, and photographed. The last stage of amplification was made nonlinear so that a large range of densities could be accurately measured. Amplifier calibrations were made by pulsing the shell of the chamber and stability of gain proved satisfactory. The absolute value of ionization was determined in the customary manner from Po α-particle ionization. (auth)

3801

INVESTIGATION ON THE LOW ENERGY END OF THE COSMIC PROTON AND MESON SPECTRUM AT SEA-LEVEL BY APPLYING A DIFFERENTIAL ABSORPTION METHOD. P. J. G. De Vos and E. Van A. Gey Van Pittius. Physica 19, 305-10(1953) April.

The low-energy end of the penetrating component in cosmic radiation is explored. The experimental arrangement is similar to one designed by Rogozinski and Lesage (Colston Papers 63(1949)). Certain variations are also introduced. The method consists in counting the number of particles emerging from a well-defined thickness of Pb and stopping in an additional differential absorber. Coincidences are triggered only by rays incident within the solid angle defined by a vertical-counter telescope. The present spectrum exhibits a remarkable resemblance to the curve obtained by the writers quoted above. An interpretation of this curve is given. (auth)

3802

THE TIME DISTRIBUTION OF DELAYED PARTICLES IN EXTENSIVE AIR SHOWERS USING A LIQUID SCINTILLATION COUNTER OF LARGE AREA. J. V. Jelley and W. J. Whitehouse. Proc. Phys. Soc. (London) A66, 454-66(1953) May.

A liquid scintillation counter, of area $1000\ \text{cm}^2$ and depth 15 cm, has been developed for experiments on the delayed particles in extensive air showers. The scintillator was used in conjunction with two trays of Geiger counters to select showers of average density $10/\text{m}^2$; the prompt and delayed particles traversing the scintillator were recorded photographically in an arrangement in which possible sources of spurious delays were eliminated. The existence of delayed particles has been confirmed and the delay distribution obtained over the range 3 to 70×10^{-8} sec. This distribution could be represented by an exponential function with half of the delayed particles arriving within $(10 \pm 2 \times 10^{-8}$ sec. The total fraction of shower particles that suffer delays in the above range was found to be $0{\cdot}85 \pm 0{\cdot}05\%$. There is evidence that showers with delayed events do not differ in average density from those without such events. A control experiment was carried out to investigate any spurious effects; this revealed μ-e decay events in the scintillator at approximately the expected rate. (auth)

3803

MEAN LIFETIMES OF V-PARTICLES AND HEAVY MESONS. W. L. Alford and R. B. Leignton. Phys. Rev. 90, 622-9(1953) May 15.

A maximum-likelihood procedure for determining mean lifetimes of V particles from cloud-chamber data ia applied to samples taken from a group of 134 neutral V particle decays. For 74 events which were consistent with a decay into a proton and a negative π meson, a lifetime of $2.5 \pm 0.7 \times 10^{-10}$ sec is obtained. Dividing the data into "low Q" and "high Q" groups on the basis of the calculated energy release in the decay, a value of $\tau_L = 2.9 \pm 0.8 \times 10^{-10}$ sec is found for those cases with $0 \leq Q \leq 50$ Mev and a value of

$\tau_H = 1.6 \pm 0.5 \times 10^{-10}$ sec is found for those cases with $50 < Q \leq 150$ Mev. While no significant difference exists between these two values, the difference is greater than for other plausible division schemes which are considered. A qualitative discussion of lifetimes is given for the case of 23 charged V-particle decays. For the charged V particles these data suggest either a lifetime less than that of the neutral V particles, provided the sample is homogeneous, or, more likely, an apparent average lifetime less than that of the neutral V particles, if the sample is a mixture of two or more types of particles. The possibility that κ and/or χ mesons make up a part of these decays is considered. (auth)

3804

FLUCTUATIONS AND LATITUDE EFFECT OF COSMIC RAYS AT HIGH ALTITUDES AND LATITUDES. H. V. Neher, V. Z. Peterson, and E. A. Stern. Phys. Rev. 90, 655-74(1953) May 15.

Using a newly developed ionization chamber, which transmits its information by radio, simultaneous balloon flights were made from widely separated stations in the summer of 1951. Bismarck, North Dakota (geomagnetic latitude, λ_m, 56°N) was used as a base station. Four flights were made from shipboard going north from Boston and five were made from Thule, Greenland (λ_m= 88°N), simultaneous with those at Bismarck. In all, 28 successful flights were made by the two expeditions. In seeking to determine the geomagnetic effects on the low-energy primaries, considerable information was gathered on the radiation that fluctuates from day to day. The chief experimental findings together with some of the conclusions that may be drawn are presented. (auth)

3805

ORIGIN AND PROPAGATION OF COSMIC RAYS. Ludwig Biermann. Ann. Rev. Nuclear Sci. 2, 335-64(1953).

The properties of primary cosmic radiation which relate to its origin and propagation are reviewed. Various aspects of solar, galactic, and universal theories are presented. The question of cosmic magnetic fields and their connection with the origin of cosmic radiation are discussed at length, since the geomagnetic effects on cosmic ray intensity have been clearly demonstrated. The literature survey pertaining to this review was concluded in April, 1952. 54 references. (L.M.T.)

3806

CLOUD CHAMBER STUDY OF COSMIC RAY ELECTRONIC SHOWERS UNDER DENSE MATERIALS. I. Š. Franchetti. Nuovo cimento (9) 10, 551-63(1953) May 1. (In English)

Pictures of electronic showers have been taken by means of a counter-controlled cloud chamber. This first paper of a series deals essentially with the methods employed in analyzing the collected data. As an example, the results obtained with a lead plate 2 cm thick inside the chamber are described. They include angular distributions, distributions according to the number of electrons, and ratio of photon-initiated to electron-initiated showers. (auth)

3807

ON THE ANGULAR CORRELATION OF THE PRODUCTS OF NUCLEAR DISINTEGRATIONS. M. Ceccarelli and G. T. Zorn. Nuovo cimento (9) 10, 540-50(1953) May 1. (In English)

Angular and energy associations between charged particles emitted in nuclear disintegrations observed in nuclear research emulsions (Ilford G5, 400 μ thick) exposed to the cosmic radiation at an altitude of 95,000 ft for 4 hr at a geomagnetic latitude of 55°N have been investigated, and a marked angular correlation for "small angles" (less than 30°) as well as probable correlation in energy have been observed for particles having energies of the order of 100 Mev. In this same energy range, an angular correlation for "large angles" (120° to 180°) has also been observed. The possible explanations of the observed angular and energy associations are discussed. (auth)

3808

ON THE ORIGIN OF PRIMARY COSMIC RADIATION. Tokuji Matsumoto and Masao Sugawara. Progr. Theoret. Phys. (Japan) 9, 1-6(1953) Jan.

It is shown that two important empirical facts concerning primary cosmic radiation, i.e., (1) the similarity of energy spectra expressed with respect to kinetic energy per nucleon of various nuclei independent of their charge numbers and (2) fairly abundant existence of heavier nuclei, can not be explained by any acceleration mechanisms. It is shown that (1) and (2) can be understood only if one assumes a new type of element formation, according to which, from the nucleon gas of extremely high temperature and pressure, various atomic nuclei are created with energy spectra $N(\epsilon) = C \exp\{-(1+\epsilon)|kT\}$ (ϵ = kinetic energy per nucleon) and with ratio $C_p : C_\alpha : C_{CNO} : C_{z>10} = 10:1:1/20:1/60$. Physical inevitability with which this assumption is introduced and its physical significance are discussed. (auth)

3809

AN EXPERIMENT ON COSMIC RAYS. P. G. Guest and Wendell M. Simmons. Am. J. Phys. 21, 357-62(1953) May.

An experiment suitable for an undergraduate laboratory course is described. A two-counter cosmic-ray telescope is employed in conjunction with a Rossi-type coincidence circuit. Details of the circuits are given. The methods of calculating the intensities of the cosmic rays are discussed, and a typical set of experimental results is shown. These results are used to illustrate the statistics of the rate of arrival of cosmic-ray particles. (auth)

3810

THE DISINTEGRATION OF V^0 PARTICLES. R. W. Thompson, A. V. Buskirk, L. R. Etter, C. J. Karzmark, and R. H. Rediker. Phys. Rev. 90, 329-30(1953) Apr. 15.

Twenty-four cases of V^0-particle decay were observed in a new magnet chamber at sea level, 12 of which have sufficiently long track lengths in the illuminated area so that the momentum determination should be rather accurate. After analysis most of the events were fitted into a scheme $V_1^0 \rightarrow p + \pi$ with an average Q value of 37 Mev, or the scheme $V^0 \rightarrow \pi + \pi + 210$ Mev. (L.M.T.)

3811

UNSTABLE PARTICLES FROM PENETRATING SHOWERS. W. D. Walker and N. M. Duller. Phys. Rev. 90, 320(1953) Apr. 15.

In the course of an experiment on penetrating showers in C, cloud-chamber pictures of 500 showers showed only 2 examples of V^0-particle decay. Fretter et al. (Phys. Rev. 89, 158(1953)) found one V^0 decay per 18 showers, working with a similar apparatus. Even after correcting for search inefficiency the rate is still less than one-fifth that of Fretter It is thought that the discrepancy results from the use of C in this experiment and Pb in Fretter's. Of 1000 shower particles observed traversing an average distance of 15 cm one was found to decay in flight compared to 14 $V^\pm$ decays in 8000 tracks as reported by Barker et al. (Phil. Mag. 43, 1201(1952)). A search for close pairs of penetrating particles coming from interactions in C revealed 22 pairs with angles of separation of the order of 5° or less in 100 showers. (L.M.T.)

3812

ON A RECENT INTERPRETATION OF STAR DATA. H. Messel and R. B. Potts. Nuovo cimento (9) 10, 496-7(1953) Apr. 1. (In English)

In a recent paper (NSA 6-5804), Cortini et al., concluded that the plural theory of meson production was not sufficient to explain their data derived from observation of nuclear explosions in emulsions exposed at high altitudes. The present paper shows that such a conclusion does not follow from their experimental results. (G.Y.)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

3813

Atomic Energy Research Establishment, Harwell, Berks (England)
THE CALCULATION OF THE ELECTROSTATIC ENERGY OF A CRYSTAL LATTICE, WITH APPLICATION TO BORON NITRIDE. K. W. Morton. Feb. 1953. 20p. (AERE-T/R-1110)

A summary is given of the Ewald method of calculating the electrostatic potentials and energies of an infinite crystal lattice. This method accelerates the convergence of the triply infinite series for the potential by transforming it by means of the formula

$$1/R = 2/\sqrt{\pi} \int_0^\infty e^{-R^2p^2}\, dp,$$

dividing the range of integration into two parts, and applying a θ-function transformation to one of the resulting series of integrals. The method is then applied to the observed boron nitride structure and the graphite-like structure, to see whether the difference in electrostatic energy could account for boron nitride preferring the former, though in so many other respects it is similar to graphite. Ewald's method is found to be cumbersome for this type of structure, and a modification is developed in which the sum over three dimensions which occurs in the expression for the potential is split into a sum over a single plane and a sum of the contributions from each plane. A β-function transformation is then applied to the sum over each plane. Using this, the electrostatic energy for the two structures is calculated more easily, and the difference found directly. Checks on the calculation are devised for Ewald's method and the major part of the modified method. (auth)

3814

THEORY OF F-CENTERS. S. I. Pekar. Translated from Zhur. Eksptl'. i Teoret. Fiz. 20, 511-22(1950). 32p. (AEC-TR-1522)

In previous studies of the F-center it was assumed that during the electron transition accompanying the adsorption of light the ions remained fixed in their equilibrium positions of the ground state (T = 0°K). This rough approximation leads to an absorption line rather than a band. The present work is a study of the line width; i.e. it takes into consideration the motion of the ions and electronic transitions corresponding to the production of different numbers of phonons. The theory leads to the correct value of the thermal dissociation energy of an F-center and to the correct value of the half-width of the F-band at high and low temperatures; it describes well the shape of the F-band and its change with temperature. (G.Y.)

ELECTRICAL DISCHARGE

3815

MEASUREMENT OF PROPAGATION VELOCITY OF THE PRINCIPAL CHANNEL IN HIGH-VOLTAGE DISCHARGE. I. S. Stekol'nikov. Doklady Akad. Nauk S.S.S.R. 85, 1013-16(1952) Aug. 11. (In Russian)

An electron-optical method for measuring the velocity of propagation of the front of an electrical discharge is described. The apparatus operates in time intervals of less than 10^{-8} sec. (G.Y.)

3816

QUENCHING OF AFTERGLOW IN GASEOUS DISCHARGE PLASMAS BY LOW POWER MICROWAVES. L. Goldstein, J. M. Anderson, and G. L. Clark. Phys. Rev. 90, 486-7 (1953) May 1.

The authors in a previous article (Phys. Rev. 90, 151 (1953)) described experimental results obtained in a study of interaction of low-power high-frequency electromagnetic waves simultaneously propagated through gaseous discharge plasmas. This note reports additional experimental results which appear to demonstrate the expected effect on the intensity of the afterglow which is most likely to be associated with the recombination of positive ions with electrons in decaying gaseous discharge plasmas. Experiments were carried out with He, Ne, A, and Ne and A mixtures, but results are only reported here for Ne. Photos show the quenching by a microwave pulse of the afterglow in a decaying plasma established in Ne at pressures of 20 and 1 mm Hg. (L.M.T.)

ELECTRONS

3817

Radiation Lab., Univ. of Calif., Berkeley
GRAPHICAL METHODS FOR DETERMINING PLANE TRAJECTORIES IN A MAGNETIC FIELD. Richard Huddlestone and Henry Kramer. Oct. 28, 1952. 32p. (UCRL-1997)

Graphical methods for the approximate solution of the equations of motion of a charged particle in a magnetic field are useful in many applications where an analytic solution presents formidable difficulties. Several methods for obtaining plane trajectories through a given magnetic field by means of finite step procedures are presented. These methods represent a compromise between desired accuracy and simplicity of application in practice. An evaluation of the stepwise and cumulative errors incurred in their use is included. (G.Y.)

3818

OF THE INFLUENCE OF MAGNETIC COLLISIONS ON THE KINETIC ENERGY OF THE ELECTRON. M. L. Kolodziejczyk. Compt. rend. 236, 1476-8(1953) Apr. 13. (In French)

A brief note illustrates the effect which magnetic collisions, as with an electromagnetic wave, have upon the equations of motion of an electron. (J.S.R.)

INSTRUMENTS

3819

Ames Lab.
OPERATING CHARACTERISTICS OF A D.C. MAGNETIC ION SOURCE. G. H. Miller, R. A. Lowry, and J. E. Osher. Mar. 20, 1953. 19p. (ISC-319)

The operating characteristics of an ion source of the type described by Kistemaker and Dekker (NSA 4-4326, 4-4327) are given. The dependence of the total ion output on the ion-source pressure, magnetic field, anode voltage, filament emission, and probe voltage is described. When hydrogen gas was used the ion source operated stably for pressures in the range 1.5 to 2.5 μ of Hg producing maximum ion currents of 3 to 5 ma. Its gas consumption was relatively high (22.5 cc/hr, STP) and the proton percentage of the ion beam was of the order of 8%. The best focusing gave a beam diameter of 5 mm on a target 2 m from the ion source. The filament lifetimes varied from 50 to more than 100 hr. The power consumption for ion beams of 3 ma or less was found to be about 0.15 watts/μa. (auth)

3820

Los Alamos Scientific Lab.
MICROANALYSIS OF RADIOACTIVE GAS MIXTURES. Harold M. Busey. Jan. 1952. 12p. (LA-1516)

The purpose of this study was to develop methods for making determinations of the chemical composition of gas mixtures containing radioactive components. A system for volumetric microanalysis was used to study mixtures containing H_2O, CO_2, nitrogen oxides, H, O, N, and the inert gases. In the order mentioned, these gases were removed singly from the mixture by reagents or traps while in contact only with Hg, glass, and the specific reagents. The method is applicable to samples of 0.05 ml with an over-all accuracy of 1%. The gas mixtures studied were those resulting from the radiolytic decomposition of aqueous uranyl nitrate solution in the homogeneous nuclear reactor at Los Alamos. A satisfactory method for collecting the very radioactive samples from this Water Boiler was developed. (auth)

3821

Tennessee Univ.

INDICATING METHODS FOR PORTABLE RADIATION DETECTORS; FIRST ANNUAL REPORT. John D. Trimmer. May 1, 1953. 28p. (NP-4559)

A limited survey of manufacturers literature on electric meters was carried out. Methods of measuring meter properties were developed and were applied to a few meters. Some attention was given to indicating methods, and to basic modes of visual perception. These survey efforts led to a new proposal for investigation of electropneumatic and pneumatic radiation detection. The problem of determining instrument parameters from step-function response is aided by tables and graphs which were prepared as a project undertaking, and which are included in the appendix. (auth)

3822

HIGH-VOLTAGE SOURCE FOR COUNTERS. R. Richard Foy and F. Camarena. Rev. mex. fís. 2, 45-50(1953) Jan. (In Spanish)

A Hartley-oscillator high-voltage source to be used with any type of counter operating either in the Geiger or proportional regions, has been constructed. The stabilized voltage can be regulated between 400 and 3000 v, and the current varies between 1.5 and 1 ma, depending on the voltage. At 1000 v the variation of the high voltage is only 0.5 v when the excitation current varies by 9 v. After 6 sec this variation is reduced to 0.1 v. When the load varies from 0 to 1 ma, the high voltage changes by 2.1 v. At 3000 v the high voltage has an alternating component of 100 cps of 0.03 v and a h-f component of less than 0.001 v. The apparatus consumes 900 ma of 115-v current, weighs 3.5 kg and is 22 × 22 × 33 cm in size. (tr-auth)

ISOTOPE SEPARATION

3823

Joint Establishment for Nuclear Energy Research (Norway)

SOME ASPECTS OF ISOTOPE ENRICHMENT BY MEANS OF HIGH SPEED CENTRIFUGES. Harald Klepp. 1953. 19p. (JENER-12)

Some of the basic theoretical aspects of centrifugal separation of isotopes are discussed, including enrichment through reduction of volume or density, combination of batch and cascade enrichments, yields, etc. The enrichment of U is presented as a specific numerical example. (L.M.T.)

3824

A METHOD OF CONCENTRATING He^3-He^4 MIXTURES. K. R. Atkins, J. C. Findlay, D. R. Lovejoy, and W. H. Watson. Can. J. Phys. 31, 679(1953) May.

A method is described for increasing the concentration of He^3 in He^4 from 2% to 64% in a single operation. The principle is similar to that employed on a smaller scale by previous workers and depends upon the fact that liquid He^4 flows much more readily than liquid He^3 through a very small leak(Pt wire sealed in pyrex capillary). (auth)

3825

THEORETICAL YIELD OF A SPIRAL THERMODIFFUSION COLUMN. Paul Renaud. Compt. rend. 236, 1555-7(1953) Apr. 20. (In French)

The example studied is a natural mixture of HCl^{35} and HCl^{37}. The yield is calculated by means of classic formulas and some simplified hypotheses. The rates of thermodiffusion, unknown for HCl, are replaced by those calculated for CH_4. This source of error alters slightly the order of magnitude. An apparatus, 50 cm in diameter, can give a yield of 100 g/day, 80% in Cl^{37}. (tr-auth)

MASS SPECTROGRAPHY

3826

MASS SYNCHROMETER DOUBLET MEASUREMENTS AT MASSES 28 AND 30. Lincoln G. Smith and C. C. Damm. Phys. Rev. 90, 324-5(1953) Apr. 15.

The conversion of the "mass synchrometer," originally designed as a time-of-flight device (Rev. Sci. Instr. 22, 115(1951); Phys. Rev. 81, 295(1951)) to an r-f mass spectrometer is briefly described. The values of ΔM which were obtained for three doublets at mass 28 (N_2-CO, C_2H_4-N_2, and C_2H_4-CO) and one at mass 30(C_2H_6-NO) are presented. (L.M.T.)

MEASURING INSTRUMENTS AND TECHNIQUES

3827

Atomic Energy Research Establishment, Harwell, Berks (England)

LOW FREQUENCY OPERATION OF BALANCED ION CHAMBERS IN AN A.C. BRIDGE. A. H. Ward. University Coll. of the Gold Coast, Achimota, ACCRA (British West Africa) and Atomic Energy Research Establishment, Harwell, Berks (England). Jan. 27, 1953. 11p. (AERE-EL/R-1107

Two TPA ion chambers are used as two arms of an a-c bridge. The bridge is balanced by adjustable resistances and capacities as the other pair of arms. Radiation in either chamber alone causes an out-of-balance current which can be measured by the bridge amplifier and phase-sensitive rectifier. Capacity effects in the bridge balance out, so long leads may be used to the chambers. Cosmic radiation also balances if the chambers are close together. With 10 cps and 12 v peak to the ion chambers the limit of sensitivity corresponds to 10^{-14} amp. Variation of performance with frequency and voltage is discussed. No high resistance greater than 10^9 ohm is needed and special insulation in the ion chambers is unnecessary. The effective time constant is long (~¼ min) due to the ion behavior in the chambers. (auth)

3828

Chemical and Physical Labs., Federal Telecommunication Labs., Inc.

IONIZATION CHEMBER INSULATING MATERIAL; NATIONAL DEFENSE CONTRACTUAL PROGRESS REPORT [FOR] JULY 15, 1949-JULY 15, 1951. (FINAL REPORT) H. G. Nordlin. Aug. 951. 281p. (ATI-115561; National Defense Contractual Progress Report 24)

A final report is presented of work of which the purpose was to derive information on insulating materials which determines their suitability for use in ionization-chamber radiac instruments. New testing methods were developed, chemical analyses were performed, a new type of chemical purification apparatus was designed, a source of γ rays was set up, and electrical tests were performed. Of the commercially available materials, Monsanto Polystyrene PIX-5 was found to be electrically least affected by γ radiation. (auth)

3829

Joint Establishment for Nuclear Energy Research (Norway)
INVESTIGATION OF THE CONDITION OF THE HYDROGEN FILLED TPA IONISATION CHAMBERS. N. Holt and M. Bogaardt. 1951. 11p. (JENER-4)

The relative sensitivities to γ rays and neutrons of two high-pressure H_2-filled TPA ionization chambers available at the JEEP reactor were tested at various pile levels. Measurements were relative to those made with an A-filled counter. A decision as to selection of one or the other counter for fast-neutron detection was involved. (G.Y.)

3830

Joint Establishment for Nuclear Energy Research (Norway)
THE JENER BETA-SPECTROMETER. Georg Trumpy. 1952. 25p. (JENER-10)

The JENER β spectrometer is of the short-lens type with no iron core. The spectrometer chamber has an effective length of 1000 mm, and the lens consists of two separate coils with 257 mm between centers. The volume of the spectrometer chamber and connecting tubes is about 40 l. A mechanical and an oil-diffusion pump provide a constant vacuum of 5×10^{-5} mm Hg. Screening baffles are made from Al in order to reduce electron scattering, and a Pb cylinder in the center of the chamber serves as a screen for direct γ radiation between source and detector. The performance of the instrument in measuring Co^{60} and Cs^{137} internal-conversion spectra is illustrated. (G.Y.)

3831

Los Alamos Scientific Lab.
EFFECT OF NEUTRON SPECTRUM ON THE RESPONSE OF A MODERATED BORON TUBE SURVEY METER. George M. Angleton. Mar. 1953. 10p. (LA-1528)

The Pee Wee (α proportional counter) was modified for the purpose of monitoring neutrons. The probe consists of a boron-lined tube surrounded by 1 inch of polyethylene moderator. A curve is presented which indicates the correction factor to be applied to the Ra-Be calibration curve when a neutron source of another energy is being monitored. The correction factor is approximately 10 for 14 Mev, 1 for 5 Mev, 0.25 for 0.01 Mev, and 2 for thermal neutrons. The useful range of sensitivity of the instrument for Ra-Be neutrons extends from 10 to 10,000 n/cm^2/sec, leveling off at higher fluxes because of circuit characteristics. (auth)

3832

Polaroid Corp.
PRODUCTION EQUIPMENT FOR RADIAC DETECTING ELEMENTS DT64( )/PD AND DT65( )/PD; FINAL REPORT [FOR] PERIOD JUNE 8, 1951 TO DECEMBER 31, 1952. O. E. Wolff. 32p. (NP-4555)

Mass production machinery was designed and constructed to automatically fabricate and package Radiac Detecting Elements DT64( )/PD and DT65( )/PD. The elements consist of small, light-tight, paper-backed foil envelopes in which are enclosed some photosensitive negative material, some positive receiving sheet, a pod of developing reagent, and calibrated gray scales for reading dosage. These components are so arranged that, in the unopened element, the emulsion side of the negative faces and is superposed on the coated side of the receiving sheet, the gray scales are located next to the receiving sheet for easy comparison, and the developer from the pod can be spread between the negative and positive. (auth)

3833

Institute of Industrial Research, Syracuse Univ.
NON-ELECTRONIC DOSE RATE INDICATING SYSTEMS; QUARTERLY PROGRESS REPORT [FOR] DECEMBER 15, 1952—MARCH 15, 1953. Henry Linschitz. 19p. (NP-4556; Quarterly Progress Report 3)

A brief summary is presented of preliminary experimental studies on fundamental mechanisms in radiation chemistry. Rigid solvents have been developed and the absorption spectra of solvated electrons in these solvents determined. Studies have begun on reversible transformations in ferrous-ferric ion systems (ferrous-pyridine ⇌ ferric thiocyanate). Attempts to identify high-energy short-lived fragments in various liquids and solutions subjected to intense pulsed x ray irradiation are described. (For previous report in series see NP-4400.) (auth)

3834

El-Tronics, Inc.
DEVELOPMENT REPORT ON RADIACMETER AN/PDR-36(XE.1): SECOND QUARTERLY PROGRESS REPORT [ON] DEVELOPMENT OF THREE ENGINEERING MODELS FROM SEPTEMBER 1, 1952 TO NOVEMBER 30, 1952. Seymour B. Horowitz. 12p. (NP-4558)

The changes in circuit design and the subsequent modification of the plastic case to fit the new circuit are discussed. (For preceding period see NP-4354.) (L.M.T.)

3835

De Paul Univ.
SCINTILLATION TECHNIQUES APPLIED TO ELECTRON ENERGY STUDIES: QUARTERLY PROGRESS REPORT [FOR] JANUARY 1, 1953 TO MARCH 31, 1953. Edwin J. Schillinger, Jr. 35p. (NP-4568; Quarterly Progress Report 4)

Preparation for investigations of the energy response of various scintillation detectors to low-energy electrons has continued. Tests of the completed scintillation counter with C^{14}, construction details of a low-energy electron accelerator, and tests of the associated circuitry are described. 20 figures. (For preceding report in series see NP-4488.) (G.Y.)

3836

Technical Operations, Inc.
RESEARCH STUDY LEADING TO THE USE OF TRANSISTORS IN RADIAC SURVEY METERS; QUARTERLY PROGRESS REPORT [FOR] JANUARY 1, 1953 THROUGH MARCH 31, 1953. A. R. Pearlman and R. R. Smyth. 38p. (TOI-53-5; Quarterly Progress Report 3)

From tests of point-contact and junction transistors in high-voltage supplies, the junction-type appears to be superior. The use of a junction transistor as a voltage regulator is described. Further tests were made on the use of transistors in counting-rate-meter circuits and the circuit schematic of a Geiger-tube junction-resistor survey meter which has been built is presented. A simple transistor oscillator has been devised for supplying driving energy to the vibrating reed of the dynamic-condenser electrometer and another circuit has been designed for the transistorized amplifier for the electrometer. (For previous report see TOI-52-8.) (L.M.T.)

3837

Radiation Lab., Univ. of Calif., Berkeley
THE RATIO OF PLATEAU TO MINIMUM GRAIN DENSITY FOR ELECTRONS. R. P. Michaelis and C. E. Violet. Mar. 4, 1953. 4p. (UCRL-2120)

Techniques are described for determining the grain counts and grain density from 300- and 3-Mev electrons entering G5 emulsions at ~5° to the emulsion-air surface. After radiation and ionization losses the mean energies of the electrons were 293.0 and 2.8 Mev. Ionization by 2.8-Mev electrons differs from minimum ionization by <1% (Sternheimer, Phys. Rev. 88, 851(1952)). The ratio of the grain densities (293/2.8 Mev electrons) is 1.087 ± 0.010, and assuming proportionality between grain density and ionization, this ratio is also that of saturation to minimum ionization. (L.M.T.)

3838

MECHANISM OF SCINTILLATION IN ORGANIC CRYSTALS. M. Ageno and R. Querzoli. Translated by Cecilia Ross from Rend. ist. super. sanita 14, 779-91(1951). 12p. (NP-2416)

An abstract of this article appeared in Nuclear Science Abstracts as NSA 6-5226. (J.S.R.)

3839

ABSOLUTE CALIBRATION OF LOW-ENERGY β EMITTERS WITH THE 4π COUNTER. L. Meyer-Schützmeister and D. H. Vincent. Z. Physik 134, 9-20(1952). (In German)

Calibration measurements on low-energy β emitters are described in which the great effect of self-absorption is indicated. Some observations on the coincidences between the two parts of the counter are depicted which lead to the conclusion that the largest part of the coincidences observed with the pure β emitters P^{32}, S^{35}, $Sr^{90} + Y^{90}$, Tl^{204}, Bi^{210}, and Pr^{142} does not arise by simultaneous emission of two particles from the preparation, that is, by a "real" coincidence, but is produced by scattering in the counter gas and on the walls of the counter tube. The probability of a "true" coincidence per disintegration is at most a few tenths of 1%. (tr-auth)

3840

A PROPOSED EXPERIMENT TO DETECT THE FREE NEUTRINO. F. Reines and C. L. Cowan, Jr. Phys. Rev. 90, 492-3(1953) May 1.

The neutrinos produced in the β decay of fission fragments in a powerful chain-reacting pile are to be allowed to pass through a large-volume (10-ft^3) liquid scintillator. The protons in the scintillator have a cross section of about 10^{-44} cm^2 for conversion by the fission-fragment neutrinos to neutrons with the emission of a positron. It seems feasible to obtain some tenths such events per minute in the detector. Loading the scintillator solution with B or Cd compounds and counting the neutron-capture γ pulse in delayed coincidence with the positron and annihilation radiation pulse assists in an important way in the reduction of background. Also necessary to the reduction of background in the experiment is the use of thick B paraffin shielding, massive composite Pb-steel shields, and Geiger-tube anticoincidence umbrellas, the latter to discriminate against double pulses arising from μ-meson decay, stars, etc. (auth)

3841

ABSOLUTE CALIBRATION OF HIGH-ENERGY β EMITTERS WITH THE 4π COUNTER. F. G. Houtermans, L. Meyer-Schützmeister, and D. H. Vincent. Z. Physik 134, 1-8(1952). (In German)

Absolute calibration measurements with the 4π counter on Na^{24}, P^{32}, K^{42}, and Pr^{142} are described. From the particular advantage of this measurement technique, independence of the decay scheme, it is assumed that at least one β^+ or β^- particle is emitted per decay and that independence of the scattering of the emitted β particle is closely approximated. The only actual source of error, the absorption of the β particles in the preparation itself, had no effect here, since only high-energy β emitters were investigated. Good agreement was obtained with measurements by the A.E.R.E. at Harwell. (tr-auth)

3842

COMPTON ELECTRON SUPRESSION IN THE GAMMA-RAY SPECTRA OF Ra(B + C), Co^{60}, AND Ta^{182}. R. M. Pearce and K. C. Mann. Can. J. Phys. 31, 592-603(1953) May.

A method of suppression of the Compton-electron background present in photoelectron spectra is described. The method employs an anticoincidence element which eliminates Compton-electron pulses in the spectrometer-detector counter and leaves photoelectron pulses unaffected. The technique has been applied to the photoelectron spectra of Co^{60}, Ta^{182}, and Ra(B + C). Evidence is presented for a previously unreported 1.01 Mev γ-ray transition in Ta^{182}. The spectrum of Ra(B+ C) is compared with the spectra reported by Ellis and by Latyshev. Some of the new transitions found by Latyshev are confirmed. Other γ rays not reported by other workers are presented here. (auth)

3843

THE MEASUREMENT OF ENERGIES AND INTENSITIES OF γ-RAYS WITH A PAIR SPECTROMETER. B. B. Kinsey and G. A. Bartholomew. Can. J. Phys. 31, 537-76(1953) May.

The performance of a pair spectrometer of the Walker and McDaniel type is discussed from both a theoretical and an experimental point of view. It is shown that the energy of the γ ray may be measured to a first approximation by the product of the distance between the inner edges of the slits which define the coincidence counters and the highest value of the magnetic field at which coincidences are found. A more accurate value of the energy of the γ ray may be obtained by adding a small correction, called the "toe" correction, to the result so obtained. The magnitude of this correction is dependent on the γ-ray energy and on the width of the slits and is obtained from calculations of the shape of the coincidence peak based on the Bethe-Heitler formula. The correction depends very little on the length of the slits or on the thickness of the radiator. The relation between the calculated correction and the slit width has been examined experimentally. It is shown that the ultimate accuracy in energy measurement depends on the homogeneity of the magnetic field and on the error involved in the calculated toe correction. The latter error can be minimized by using very narrow slits and may be eliminated by plotting the value of magnetic field at the upper limit of the coincidence spectrum against the slit width and extrapolating the curve so obtained to zero slit width. The uncertainty in the magnetic field of the present instrument introduces a possible systematic error of about 0.05%. Measured values of the energies of a number of neutron-capture γ rays are compared with the values derived from the energy balance in (d,p) reactions. The results agree within 0.1%. 23 references. (auth)

3844

ENERGY SELECTION OF CHARGED PARTICLES BY A MAGNETIC FIELD. J. W. Gardner. Can. J. Phys. 31, 459-68(1953) May.

The problem of obtaining a sharply defined monoergic beam of particles from an omnidirectional, polyenergetic source without the use of slits is examined. A magnetic field is suggested which will achieve this in the idealized case when the source and counter are of vanishingly small dimensions and the particles are confined to the median plane. The proportional spread in energy (ΔE/E) of particles arriving at the counter, due to the finite dimensions of the source and counter and a small component of particle velocity out of the median plane, is then investigated. Finally some numerical estimates are made of ΔE/E and of the magnetic fields required in particular cases. (auth)

3845

ENERGY LOSS OF HIGHLY CHARGED PARTICLES PRODUCED BY FISSION AND BY COSMIC RAYS. III. THE LINEAR DENSITY OF DELTA RAYS; EXPERIMENTS. Pierre Demers and Zofia Lechno-Wasiutynska. IV. THE LINEAR DENSITY OF DELTA RAYS; THEORETICAL. Zofia Lechno-Wasiutynska. Can. J. Phys. 31, 480-96 (1953) May.

Delta rays having an energy as low as 2 to 5 kev have been counted along the tracks of mesons, protons, and α rays of low velocity, allowing the identification of each. Three methods are presented and applied to determine the efficiency f of counting δ rays of various energies; measured values of f vary between 0.05% at 2 kev and 100 to 180% near 50 kev. The number of grains, and the energy distribution among visible δ rays, are analyzed. A new method of determining velocity, based on the analysis of the number of grains in the δ rays, is presented. In the appendix, the effect of relativistic corrections is computed and discussed. It is small except at large velocities where comparison with experiment is difficult. (auth)

3846

EXTERNAL-CATHODE GEIGER-MÜLLER COUNTERS FILLED WITH PURE METHYLAL FOR INTENSE IRRADIATION. Daniel Blanc. J. phys. radium. 14, 271-2(1953) Apr. (In French)

G-M counters with external cathode and filled with polyatomic vapors or rare gases, become unusable in intense radiation. A pure organic vapor permits the use of the G-M counters under these conditions. Methylal, because it is easily purified and can be introduced under relatively high pressures has been used. (J.S.R.)

3847

THE ATOMIC POSITION AND SIZE OF THE THALLIUM IONS IN KCl(Tl) PHOSPHORS. W. A. Runciman and E. G. Steward. Proc. Phys. Soc. (London) A66, 484-91(1953) May.

A new x-ray investigation has been made of the KCl(Tl) phosphor in view of the discrepancy between the early theory of Fromherz involving formation of complexes in the phosphor and the recent theoretical work of Williams, in which substitutional entry of the Tl ions is assumed. The present study has now shown (a) that the expansion of the KCl structure due to the incorporation of Tl is in agreement with Vegard's law and (b) that Tl$^+$ ions enter the structure substitutionally. The present results differ from those obtained by Stasiw and Saur in a less detailed x-ray study. The intensities of x-ray reflections have also been used to establish the atomic position of the activator atoms in the phosphor and the results fully confirm the interpretation of the observed lattice expansions. A new value of 1·42$_7$ A has been obtained for the ionic radius of the Tl$^+$ ion in six-fold coordination with Cl$^-$ ions. This is of importance in the detailed calculations of the luminescence of KCl(Tl) which have been made by Williams and others. 24 references. (auth)

3848

OPERATION OF SELF-QUENCHING GEIGER-MÜLLER COUNTERS. Daniel Blanc. J. phys. radium. 14, 260-6 (1953) Apr. (In French)

The theory of counters filled with polyatomic constituents or with halogens is analyzed. The fundamental characteristics—latent period of induction, propagation of the discharge along the wire, dead time, pulse shape, plateau curve, and variables which control the plateau—are defined. The various types of counters and their applications are discussed. A detailed review is given of the Maze type or external-cathode counter. 152 references. (J.S.R.)

3849

THE GRAIN DENSITY AND THE PROCESS OF TRACK FORMATION IN NUCLEAR EMULSIONS. I. GRAIN DENSITY AND DEVELOPING FACTOR. M. Della Corte, M. Ramat, and L. Ronchi, Jr. Nuovo cimento (9) 10, 509-25(1953) May 1. (In English)

A critical survey of various methods employed for grain-density measurements is given, and a new scheme for the process of track formation is proposed. According to this scheme, which takes into account a process of induced development, grain density for a given emulsion appears to depend on two main factors, namely, the probability that a grain be impressioned, which is obviously directly related to the energy loss, and what the authors call the "developing factor" K, which is characteristic of the degree of development of the plate. Both these factors can easily be determined experimentally. A series of measurements along tracks due to particles of different energy appears to confirm the validity of the scheme. (auth)

3850

SIMPLE EXTREMELY SENSITIVE MEASUREMENT OF C^{14}. G. Rohringer and E. Broda. Z. Naturforsch. b8, 159-60 (1953) Mar. (In German)

The sensitivity of the measurement of C^{14} can be increased by filling a counting tube with pure CO$_2$ under pressure of 10 to 40 cm of Hg and using an external quenching circuit. Activities as low as $\sim 2 \times 10^{-12}$c can be detected without difficulty. (J.S.R.)

3851

ELECTRON BEAM INTERFEROMETER. L. Marton, J. Arol Simpson, and J. A. Suddeth. Phys. Rev. 90, 490-1 (1953) May 1.

A description is presented of an amplitude-splitting-type electron-beam interferometer similar to one suggested earlier (Marton, Phys. Rev. 85, 1057(1952)). The instrument consists of three crystal mounts each 100 A thick, 3 mm in diameter, 3.48 cm apart, and each of which can be rotated about the optical axis. The mount of the crystal, first in order of penetration of the electron beam, can be translated along the axis to change the path difference. Several metallic crystals were tried but Cu was used for the final tests. Two difficulties were encountered in aligning and testing the instrument, one due to the peculiarities of using diffraction as a beam-splitting mechanism, the other the operation of the instrument due to a very low intensity. A set of interference fringes superimposed upon uneven crystal background and a microphotometer tracing of some of the fringes are shown. (L.M.T.)

3852

RADIOACTIVITY DETECTOR. R. Richard Foy and F. Camarena. Rev. mex. fís. 2, 51-6(1953) Jan. (In Spanish)

A portable battery detector that integrates the pulses from a Geiger counter has been constructed. Two different sensitivity ranges are available. At maximum sensitivity, the microammeter can detect a current of 5×10^{-10} amp. The high voltage can be regulated between 900 and 1050 v in steps of 30 v. Under the best conditions, the cosmic radiation, which corresponds to about 3.2 counts/sec, gives a deviation of 3×10^{-8} amp with fluctuations of the order of 5×10^{-9} amp. Readings are proportional, within the limit of fluctuations, to the number of pulses. The apparatus weighs 5 kg and is 16 × 10 × 34 cm in size. (tr-auth)

3853

A FAST AND EFFICIENT NEUTRON DETECTOR. John Kirkbride. Nature 171, 564(1953) Mar. 28.

Solutions of borazole in para-xylene, with para-terphenyl added to a concentration of 5 g/l, have the following useful properties: (1) processes of exciton transfer in xylene are not quenched by the borazole; (2) scintillation pulses obtained by irradiation with Po α particles are proportional in intensity to the molar concentration of xylene; (3) scintillation response time is less than 10^{-8} sec. Thus, an equimolecular solution of borazole in xylene is a detector with a boron density increased by a factor of 400, and a response time shortened by a factor of 100, when compared with the BF$_3$ counter. (G.Y.)

3854

ACTIVATION OF LITHIUM IODIDE BY EUROPIUM. James Schenck. Nature 171, 518-19(1953) Mar. 21.

A single crystal of LiI activated with an impurity of 0.05 mole % europous chloride has been grown from the melt and found to be a relatively efficient scintillator. The luminescence efficiency for γ rays was found to be 36% of that of NaI(Tl). The decay time constant of the phosphor is 2.0 μsec. Pulse-height spectra produced by slow neutrons and by γ rays are illustrated. (G.Y.)

MESONS

3855

SUBNUCLEAR PARTICLES. John S. Blair and Geoffrey F. Chew. Ann. Rev. Nuclear Sci. 2, 163-86(1953)

This review, the literature survey of which was concluded in March, 1952, is concerned with unstable particles which appear to have a strong and intimate connection with nuclear matter and nuclear forces. The most prominent of these "subnuclear" particles are pions, to which an independent treatment is given here. Following this the data on τ, V, and κ particles are treated. Electrons, neutrinos, and muons are deliberately omitted from the discussion. For a review of current muon knowledge, Marshak's article (Ann. Rev. Nuclear Sci. 1, 1-42(1952)) may be consulted. 92 references. (L.M.T.)

3856

EMISSION OF γ QUANTA IN μ-MESON DECAY. G. V. Skornyakov. Doklady Akad. Nauk S.S.S.R. 89, 431-4(1953) Mar. 21. (In Russian)

Ratios of the probability of μ-meson decay with γ emission to probability of radiationless decay are derived for several forms of the hamiltonian. (G.Y.)

3857

NON-ADIABATIC TREATMENT OF NUCLEON-PION SCATTERING. S. Fubini. Nuovo cimento (9) 10, 564-72 (1953) May 1. (In English)

The Tamm-Dancoff nonadiabatic method is applied to the study of nucleon-pion scattering. An integral equation is obtained. It is resolved by making use of some approximations, and numerical results in satisfactory agreement with experiment are obtained. The existence of an isobaric state of the nucleon with spin $^3/_2$ and isotopic spin $^3/_2$ is also deduced. (auth)

3858

ARTIFICIAL π MESONS. C. J. Bakker. Ned. Tijdschr. Natuurk. 19, 90-101(1953) Apr. (In Dutch)

This brief review was presented at a symposium of the Nederlandse Natuurkundige Vereniging, held Jan. 3, 1953, at Amsterdam. Production and properties of π mesons are discussed. 23 references. (G.Y.)

3859

SCATTERING OF MESONS BY MESONS. Juan de Oyarzabal. Rev. mex. fis. 1, 52-63(1952) Apr. (In Spanish)

The covariant formalism of Dyson is applied to the analysis of meson-meson scattering in the neutral pseudoscalar theory, account being taken of radiative corrections due to the interaction of these particles with the vacuum, giving rise to emission and absorption of virtual nucleons. Under these conditions, an explicit form is calculated for the fourth-order term in the coupling constant of the element of the S matrix that describes this process. By the way of an example, the case of mutual scattering of low-energy mesons is studied. (tr-auth)

3860

DOUBLE MESON PHOTOPRODUCTION. R. D. Lawson and S. D. Drell. Phys. Rev. 90, 326-7(1953) Apr. 15.

The pair production of mesons by γ rays incident on protons, specifically the process $\gamma + p \rightarrow p' + \pi^+ + \pi^-$ is considered here. The cross section for the production of π^- mesons by an incident γ ray is obtained from a straightforward third-order perturbation calculation of S matrix. The energy is shared symmetrically by the π^+ and π^- pair. A plot of the cross section for π^- meson production vs. the energy of the π^- meson for 400-Mev γ rays is presented. For 400-Mev γ rays the cross section, integrated over all meson energies is 1.15 $(g^2/4\pi)^2$mb, where $g = (\mu/2M)f$ is the usual coupling constant in the derivative coupling theory. (L.M.T.)

MICROWAVES

3861

ONE TO TWO MILLIMETER WAVE SPECTROSCOPY. I. William C. King and Walter Gordy. Phys. Rev. 90, 319-20(1953) Apr. 15.

Spectral line measurements are reported at several positions between 1.37- and 2.3-mm wavelengths (200 to 130 kMc). The highest spectral transition previously measured with microwave electronic techniques was at 128 kMc (Phys. Rev. 84, 1178(1951)). The results, like the previous ones, were obtained with Si crystal multipliers driven by Raytheon klystrons, however the multiplier and detector had been redesigned, the principal improvement being the reduction of the physical size of the crystals. The rotational frequencies obtained with OCS are presented along with the redetermined spectral constants. It is thought that spectral transitions as high as 300 kMc are now possible using the newly designed multiplier and detector. (L.M.T.)

MOLECULAR PROPERTIES

3862

THE MICROWAVE ABSORPTION SPECTRUM OF $(O^{16})_2$ AND $O^{16}O^{17}$. S. L. Miller and C. H. Townes. Phys. Rev. 90, 537-41(1953) May 15.

The theory of the fine structure of O_2 is made somewhat more complete and fitted to the observed microwave spectrum. This gives $B_0 = 43{,}102 \pm 5$ Mc for $O^{16}O^{16}$. In addition there is evidence for the effect of higher order terms such as centrifugal distortion on the magnetic-interaction constants. Magnetic hyperfine structure has been observed in the spectrum of $O^{16}O^{17}$. The spectrum agrees with that predicted on the basis of a perturbation hamiltonian $bI \cdot S + cI_zS_z$, where $b = -102$ Mc and $c = 140$ Mc. The value of $^5/_2$ for the spin of O^{17} is confirmed. (auth)

3863

THE ELECTRONIC STRUCTURE OF O_2. S. L. Miller, C. H. Townes, and M. Kotani. Phys. Rev. 90, 542-3(1953) May 15.

The magnetic hyperfine structure parameters which have been evaluated from an analysis of the spectrum of $O^{16}O^{17}$ are used to obtain information on the electronic structure of O_2. These values show that the unpaired electrons are primarily in $p\pi$ orbits but have approximately 2.5% s character. (auth)

NEUTRONS

3864

Neutron Cross Section Advisory Group, AEC
NEUTRON CROSS SECTION COMPILATION; SUPPLEMENT 1. Brookhaven Neutron Cross Section Compilation Group. Nov. 20, 1952. 22p. (AECU-2040(suppl.1))

Data from recent work on neutron cross-section compilation have been evaluated and tabulated. Where no previous values were known, the new values have been listed as "new data." In the cases where values were given in the original compilation, the new data have been evaluated with the old and have been so designated in the table. When no significant change resulted from the consideration of these new data, a new value has not been listed. Reevaluations of the old data warrant changes in the cross section; these have been labeled as "re-evaluations." Fourteen cross-section curves are included for replacement or revision of the corresponding ones in AECU-2040. (J.E.D.)

3865

THE AVERAGE NUMBER OF NEUTRONS EMITTED IN

THE SPONTANEOUS FISSION OF ^{242}Cm. F. R. Barclay and W. J. Whitehouse. Proc. Phys. Soc. (London) A66, 447-53(1953) May.

The average number ν of neutrons emitted in the spontaneous fission of Cm^{242} has been measured by a method depending on the device of counting only those neutrons which are detected after the occurrence of a fission. In this way the effect of neutrons from sources other than spontaneous fission is eliminated. The value found for ν is 3·0 neutrons per fission. The estimated standard error is 10 to 15%. (auth)

NUCLEAR PHYSICS

3866

RADIATIVE WIDTHS OF DIPOLE TRANSITIONS IN LIGHT ELEMENTS. D. H. Wilkinson. Phil. Mag. (7) 44, 450-2 (1953) April.

Goldhaver and Sunyar (Phys. Rev. 83, 906(1951)) used Weisskopf formulas in classifying nuclear isomers of low γ-ray energy and large spin change. The classification of 22 light-element dipole transitions (11 magnetic, 11 electric) of high γ energy and small spin is presented here, also by use of Weisskopf formulas. From the survey it is seen that (1) electric dipole matrix elements are not small in light nuclei of fairly high excitation, and (2) while a safe distinction cannot be made between E1 and M1 transitions on the basis of radiative width the width can be predicted from a knowledge of the transition. (L.M.T.)

3867

EFFECT OF NUCLEONIC ORBITS ON CAPTURE CROSS SECTIONS OF SLOW NEUTRONS AND ON SPIN OF ODD-ODD NUCLEI. I. A. Vaĭsman. Doklady Akad. Nauk S.S.S.R. 88, 431-4(1953) Jan. 21. (In Russian)

Capture cross sections and spins of selected odd-odd nuclei are grouped by nuclear configurations and compared with values of the same properties of neighboring nuclei. Periodic aspects are discussed. (G.Y.)

3868

ANGULAR CORRELATION OF NUCLEAR RADIATION. Hans Frauenfelder. Ann. Rev. Nuclear Sci. 2, 129-62(1953).

A short account of the theoretical and experimental work on angular correlation of successive nuclear radiation is presented. The paper is confined to problems involving a well-defined intermediate nuclear state. Other topics, e.g., simultaneous emission of two or more particles, radiation from aligned nuclei, and angular distribution of nuclear reactions, are omitted completely. 137 references. (auth)

3869

THE ORIGIN AND ABUNDANCE DISTRIBUTION OF THE ELEMENTS. Ralph A. Alpher and Robert C. Herman. Ann. Rev. Nuclear Sci. 2, 1-40(1953)

Data on the cosmic relative abundances of the elements are presented, and several theories that have recently been developed to explain the origin and abundance distribution of the elements are reviewed. These theories include: equilibrium theories, both basic and modified; nonequilibrium theories, in which discussions are presented of the cosmological model, neutron-capture cross-section data, the neutron-capture process, and the formation of light nuclei: the polyneutron fission theory; and the matter creation theory. Of the theories reviewed the authors feel that the theory of element formation principally by neutron-capture reactions in the expanding universe suffers fewer difficulties than the others. 197 references. (L.M.T.)

3870

ENERGY PRODUCTION IN STARS. E. E. Salpeter. Ann. Rev. Nuclear Sci. 2, 41-62(1953).

As a prelude to the discussion of energy production, empirical astrophysical data and stellar structure and evolution are reviewed briefly. This information, plus a knowledge of relevant reaction rates as a function of temperature and density, is necessary to draw quantitative conclusions about stellar energy production. The contributions of thermonuclear reactions, the proton-proton chain, and the carbon-nitrogen cycle, to the energy production in main-sequence stars are discussed. One section is devoted to stars which have exhausted their H_2 supply. White dwarfs, red giants, variable stars, novae, and supernovae are briefly reviewed. 59 references. (L.M.T.)

NUCLEAR PROPERTIES

3871

NUCLEAR RADII. D. Curie. Translated by S. Shewchuck from J. phys. radium 12, 941-9(1951). 26p. (AEC-TR-2026)

A brief abstract of this article appears in Nuclear Science Abstracts as NSA 6-1313. (L.M.T.)

3872

ISOTOPIC SPIN SELECTION RULES. I. RADIATIONS FROM ^{16}O. D. H. Wilkinson and G. A. Jones. Phil. Mag. (7) 44, 542-7(1953) May.

This investigation is concerned with the selection rule that a transition with $\Delta T = 0$ is forbidden for electric dipole radiation in a self-conjugate nucleus. The lowest states of O^{16} are considered since this isotope provides examples of both the operation and violation of the rule and enables rough limits to be set as to its validity. (L.M.T.)

3873

THE TOTAL NEUTRON CROSS SECTIONS OF GOLD, CHLORINE, AND PHOSPHORUS. S. C. Snowdon and W. D. Whitehead. Phys. Rev. 90, 615-18(1953) May 15.

The total neutron cross sections of Au, Cl, and P have been measured over the energy range 100 to 700 kev using the monoergic neutrons from the H^3(p,n)He^3 reaction with an energy resolution of about 40 kev. Pronounced resonances were found in P, slight indications of resonances were found in Cl, and no resonances were found in Au. (auth)

3874

TOTAL CROSS SECTIONS OF CHLORINE, SODIUM, TITANIUM, AND BROMINE FOR FAST NEUTRONS. H. R. Dvorak and R. N. Little, Jr. Phys. Rev. 90, 618-22(1953) May 15.

Relatively new liquid scintillation counter methods were adapted to detect fast neutrons with a heretofore unattainable efficiency of about 19%. The geometry obtained was the so-called "good" geometry, which was a half angle at the counter of 2.7°. With the more efficient counter reasonable counting times could be obtained with the detector subtending a half angle of only 2.7° from the target. The neutrons were obtained by using a modified Cockcroft-Walton linear accelerator of 100-kev bombarding energy. The neutron energy range was 2.15 to 2.82 Mev. A C cross-section curve was obtained as a check on this method, and agreement with previously reported values was excellent. The Cl and Na cross sections were found to be about 3×10^{-24} cm^2, as determined indirectly by using CCl$_4$ and NaCl. The Ti cross section was found to be about 4.1×10^{-24} cm^2 by using powdered Ti metal. The Br cross section was found to be about 3.7×10^{-24} cm^2, by using a sample of liquid Br. No large resonances were found in the energy region available. Data were also taken on the angular distribution of the number of neutrons with respect to the forward direction of the incident deuteron beam and were found to agree well with theory. (auth)

3875

NUCLEAR MOMENTS. Bernard T. Feld. Ann. Rev. Nuclear Sci. 2, 239-60(1953).

This review is primarily, but not exclusively, a survey of work reported in 1951. Ramsey (Ann. Rev. Nuclear Sci. 1, 97-106(1952)) reviewed this field for 1950. Techniques of measurement, phenomena associated with nuclear moments, theoretical interpretations by nuclear models, and results of some measurements are included. 178 references. (L.M.T.)

3876

HIGH ENERGY FISSION. R. W. Spence and G. P. Ford. Ann. Rev. Nuclear Sci. 2, 399-410(1953).

This review concerns work done on fission using bombarding particles above thermal energies. The first section which is divided into two ranges of elements (from Th up and from Bi down) covers results which indicate at what energies neutrons, photons, and charged particles have been observed to induce fission and gives some idea of fission cross sections. The second section is concerned with observed changes in modes of fission as the target element and the energy of the bombarding particle are changed. The literature survey was concluded in June, 1952. 42 references. (L.M.T.)

3877

THE QUADRUPOLE MOMENT RATIO OF I^{129} AND I^{127} FROM PURE QUADRUPOLE SPECTRA. Ralph Livingston and Henry Zeldes. Phys. Rev. 90, 609-10(1953) May 15.

The pure quadrupole spectra for I^{129} and I^{127} have been observed in SnI_4 at 77 and 20°K. The nuclear quadrupole moment ratio has been determined to be $Q(I^{129})/Q(I^{127}) = 0.701213 \pm 0.000015$. (auth)

3878

THE QUADRUPOLE MOMENT OF Li^7. Edward G. Harris and Michel A. Melkanoff. Phys. Rev. 90, 585-7(1953) May 15.

The quadrupole interaction energy eqQ for Li^7 in Li_2 has been reported to be positive. In an attempt to determine $Q(Li^7)$ a calculation of q has been made using two approximate wave functions for Li_2. One of these is a Heitler-London function including inner shells and the other a twelve-term variational function. The two functions lead to dissociation energies of 0.27 ev and 0.48 ev, respectively. The experimental value is 1.14 ev. The results of the two calculations differ in sign. The more accurate variational function leads to a negative q and consequently a negative value of $Q(Li^7)$. Unfortunately, the electronic and nuclear parts of q are nearly equal in Li_2 so that the magnitude and even the sign are still uncertain. (auth)

3879

GEOMETRICAL CHARACTERIZATION OF NUCLEAR STATES AND THE THEORY OF ANGULAR CORRELATIONS. U. Fano. Phys. Rev. 90, 577-9(1953) May 15.

Degenerate states of nuclei, atoms, or radiations are identified by their tensor properties, that is, by the mean values of a set of multipole operators. A treatment is outlined which serves to construct angular-correlation functions on a geometrical basis and provides a geometrical interpretation of known correlation formulas; the dynamics of specific nuclear reactions influences only a final averaging procedure. (auth)

3880

SPIN AND PARITY OF THE 2.3-MEV EXCITED STATE OF Te^{124}. Franz R. Metzger. Phys. Rev. 90, 328-9(1953) Apr. 15.

The directional correlation of the 1.7- and 0.6-Mev and the 2.06- and 0.6-Mev γ cascades of Te^{124} were investigated separately. From the results it is concluded that the 1.7-Mev transition in Te^{124} is almost pure E1 and that the 2.3 Mev excited state of Te^{124} has spin 3, odd parity. Results from the 2.06- and 0.6-Mev cascade give the same spin and parity assignments to the 2.66-Mev level in Te^{124}. As a result of these investigations the authors are inclined to make the assignment 4+ to the ground state of Sb^{124} rather than 3- as has been indicated by others. (L.M.T.)

3881

NUCLEAR MAGNETIC RESONANCE MEASUREMENTS OF SELENIUM. H. E. Walchli. Phys. Rev. 90, 331-2(1953) Apr. 15.

The nuclear magnetic resonance of Se^{77} was measured using a 9500-gauss magnetic field, a BC-221 frequency meter calibrated against standard frequency signals of WWV, and an externally controlled crystal oscillator. The sample consisted of ~3 ml of H_2Se and determinations were made relative to the resonance of D and a 1-ml sample of D_2O containing 0.1M $MnSO_4$. The ratio of the resonance frequency of Se^{77} to that of D was found to be 1.24211 ± 0.00010. When this result is compared to that of Dharmatti and Weaver (Phys. Rev. 86, 259(1952)) who used a H_2SeO_3 sample, it is found that there is good agreement after allowing for a chemical shift of 0.15% between the H_2Se and H_2SeO_3 resonance fields. (L.M.T.)

3882

EFFECT OF THE ELECTRIC QUADRUPOLE INTERACTION ON THE GAMMA-GAMMA DIRECTIONAL CORRELATION IN Cd^{111}. H. Albers-Schönberg, F. Hänni, E. Heer, T. B. Novey, and P. Scherrer. Phys. Rev. 90, 322-3(1953) Apr. 15.

In the course of experiments relative to the Cd^{111} γ-γ cascade, the anisotropy was found to depend strongly on the source material, metallic sources showing strong anisotropic and ionic crystal sources nearly isotropic correlations. The question arose as to whether the source effects are due to the magnetic field of the electron shell (magnetic interaction) or to an inhomogeneous electric crystalline field (quadrupole interaction). Frauenfelder (Phys. Rev. 82, 549(1951)) discussed the first possibility. A series of experiments are described here which further test the magnetic interaction and investigate the presence of the electric quadrupole interaction. (L.M.T.)

3883

ON THE ENERGY LEVELS OF NUCLEI. Félix Joachim Wiśniewski. Compt. rend. 236, 1483-4(1953) April 13. (In French)

The energy levels of Ne^{20}, Ne^{21}, Mg^{24}, Mg^{26}, Al^{28} and S^{34} can be represented by the equation $E_n = Kn(n + 1)$, where n is a whole number and K is a constant. The energy levels can also be interpreted as the rotation levels. (J.S.R.)

NUCLEAR REACTORS

3884

Joint Establishment for Nuclear Energy Research (Norway) MEASUREMENTS OF NEUTRON AND GAMMA RADIATION AROUND THE JEEP. M. Bogaardt and N. Holt. 1951. 6p. (JENER-2)

Neutron and γ radiation around the JEEP reactor has been measured with BF_3 counters (with and without Cd) and the argon TPA chamber. Points of measurement are located on a diagram. (J.S.R.)

3885

Joint Establishment for Nuclear Energy Research (Norway) CALCULATIONS OF THE NEUTRON FLUX DISTRIBUTION IN THE REACTOR TANK, THE REFLECTORS AND THE THERMAL COLUMN OF THE URANIUM PILE AT KJELLER. N. Holt and H. Klepp. 1951. 23p. (JENER-3)

The cylindrical core of the JEEP reactor, which contains U, D_2O, and Al, is 90 cm in diameter. It is surrounded by 10 cm of D_2O reflector and 80 cm of graphite reflector. The thermal column extends from the graphite reflector as a right-angled parallelopiped of size 1.75 × 1.75 × 2.25 m, beginning at a distance 1.75 m from the center of the reactor, the central line of the thermal column pointing to the center of the reactor. Detailed calculations of the neutron flux distribution based on the one-group theory, i.e., reckoning all the neutrons as thermal, are presented. (G.Y.)

3886

Joint Establishment for Nuclear Energy Research (Norway)

THE REACTIVITY OF THE JEEP AS A FUNCTION OF CONTROL PLATE POSITION. M. Bogaardt. Aug. 1951. 7p. (JENER-5)

The results of measurements of the doubling time of the JEEP reactor level as a function of control plate position are given, the doubling times being translated in terms of reactivity. A quantity called "shut-off power," defined as the amount of reactivity which may be balanced by moving the control plate from the completely out position to a given position between the reactor and reflector, is also given as a function of position. (L.M.T.)

3887

Joint Establishment for Nuclear Energy Research (Norway)
MEASUREMENTS OF THE DISTRIBUTION OF THERMAL NEUTRONS AND Rh-RESONANCE NEUTRONS IN ISOTOPE CHANNEL 5-11. Kjell Steenberg. 1951. 12p. (JENER-6)

Resonance- and thermal-neutron densities in channel 5-11 of the JEEP reactor were determined by activation of both Cd-shielded and unshielded Rh foils. The measurements are not absolute, but are relative to activities induced in reference foils. (G.Y.)

3888

Joint Establishment for Nuclear Energy Research (Norway)
THE FIRST RUNNING-UP OF THE NUCLEAR REACTOR AT KJELLER, USING TWO AUXILIARY BF_3-COUNTERS IN CONNECTION WITH A 100 mc Ra-BE NEUTRON SOURCE. N. Holt, H. Klepp, and K. Steenberg. 1951. 15p. (JENER-7)

The Kjeller D_2O-moderated reactor (JEEP) was run up to criticality for the first time on July 30, 1951 by raising the D_2O level. A 100-mc Ra-Be neutron source was used until k was large enough to multiply the background neutrons to such an extent that they could be counted by the BF_3 counters employed. D_2O levels and counter readings are tabulated for the entire course of the experiment. (G.Y.)

3889

Joint Establishment for Nuclear Energy Research (Norway)
MEASUREMENTS OF NEUTRON DENSITIES IN THE JEEP BY ACTIVATION OF Na_2CO_3 AND ABSOLUTE COUNTING OF THE ACTIVITY. Kjell Steenberg. 1952. 8p. (JENER-8)

The use of Na_2CO_3 to measure the neutron densities in the JEEP reactor is advisable since both C and O have very low absorption cross sections and Na^{24} decay is by a β particle and two immediate γ's. A coincidence arrangement for the detection of the β and γ's is described and results of the measurements are presented. (L.M.T.)

3890

Joint Establishment for Nuclear Energy Research (Norway)
SOME REMARKS ON THE INFLUENCE OF THE EXPANSION OF HEAVY WATER ON THE REACTIVITY OF A NUCLEAR REACTOR. M. Bogaardt. 1952. 6p. (JENER-9)

Calculations based on elementary pile theory show that there is an almost linear dependence of the reactivity of a nuclear reactor on the temperature of the moderator. The non-linear results obtained by the French (see NSA 6-696) may be explained by taking into account the expansion of the D_2O. (J.S.R.)

3891

THEORY OF HOMOGENEOUS NUCLEAR REACTORS. I. EFFECT OF NEUTRON SPECTRUM ON STATIONARY CONDITIONS IN A REACTOR. Alejandro Medina. Rev. mex. fis. 2, 1-44(1953) Jan. (In Spanish)

This is the first of a series of papers devoted to the theory of nuclear reactors. The ordinary diffusional approach for homogeneous reactors is first completed considering the spectra of fast neutrons produced in fission and the fast-fission effect. This results in the obtention of integro-differential diffusion equations, which are solved. The theory naturally leads to a distinction between fast, intermediate, and slow reactors. Of course, diffusion theory equations are not expected to represent the actual behavior of a fast pile. Nevertheless the method illustrates the features of the steps to be taken when transport theory is used. Critical equations and inhour equations are given. In this first paper only the stationary state is treated. Later, pile kinetics and transport-theory methods will be considered. (auth)

NUCLEAR TRANSFORMATION

3892

Nuclear Development Associates, Inc.
NEUTRON REACTIONS AND THE FORMATION OF THE COMPOUND NUCLEUS. H. Feshbach, C. Porter, and V. F. Weisskopf. Nuclear Development Associates, Inc. and Massachusetts Inst. of Tech. Apr. 10, 1953. 30p. (NYO-3076; NDA-15B-4)

Predictions by the continuum or strong-interaction theory of total neutron cross sections, which do not agree with experimental values, are compared with the results of an intermediate coupling theory. The associated theory of resonances is treated briefly, and an illustrative calculation of an intermediate interaction between the incoming particle and the target nucleus is carried through in some detail. (G.Y.)

3893

Carnegie Inst. of Tech.
SYNCHROCYCLOTRON PRODUCTION AND PROPERTIES OF MAGNESIUM 28. John W. Jones and Truman P. Kohman. Mar. 1, 1953. 5p. (NYO-3620)

Silicic acid was bombarded with 350-Mev protons to produce Mg^{28} by the reaction $Si^{30}(p,3p)Mg^{28}$. A Mg^{28} half life of 22.1 ± 0.3 hours was derived from a decay curve covering seven other half lives. The Al^{28} half life determined was 2.4 min. The latest results of Sheline and Johnson (Phys. Rev. 90, 325(1953)) for these half lives are 21.3 hours and 2.3 min, respectively. Aluminum absorption curves of the Mg^{28}-Al^{28} mixture showed two electronic components of ranges 65 and 1450 mg/cm^2. The latter corresponds to the 2.86-Mev β of Al^{28}, and the former representing ~0.3-Mev β energy is assigned to Mg^{28}. The decay of Mg^{28} to an excited state of Al^{28} with consequent γ emission is suggested. Several γ rays were observed upon examination of the Mg^{28}-Al^{28} mixture but no decay scheme is proposed. (L.M.T.)

3894

Radiation Lab., Univ. of Calif., Berkeley
CHARACTERISTICS OF NEUTRAL MESON PRODUCTION IN THE PROTON BOMBARDMENT OF CARBON NUCLEI. Walter Ellis Crandall and Burton J. Moyer. Feb. 13, 1953. 33p. (UCRL-2110)

Since the first article (Phys. Rev. 77, 213(1950)) identifying photon radiation ascribed to meson decay in the cyclotron target, improved pair-spectrometer equipment and techniques now enable a better and more complete measurement of the photon spectrum. This report presents more detailed information concerning the energy distribution of π^0 mesons emitted from a target bombarded by 340-Mev protons, and of the angular distribution with which they emerge from proton-nucleon collisions. Also an evaluation of the absolute yield of π^0 mesons for 340-Mev protons incident upon C and the variation of yield with proton energy are presented. Photon spectra radiated from the cyclotron target in various directions were monitored in relative intensity, and the spectrum in the 90° direction was placed upon an absolute scale by calculation of the pair-spectrometer spectral efficiency and measurement of the proton-beam current. Deductions concerning angular and energy distributions are possible in view of the $\pi^0 \rightarrow 2\gamma$ origin of the photons. (L.M.T.)

3895
Radiation Lab., Univ. of Calif., Berkeley
THE PRODUCTION OF CHARGED PI MESONS BY NEUTRONS ON OXYGEN (thesis). Franklin C. Ford. Mar. 20, 1953. 51p. (UCRL-2148)

Charged mesons were produced in O gas in a cloud chamber bombarded by high-energy neutrons from a LiD target placed in the 340-Mev proton beam of the 184-in. cyclotron. The postulated reactions producing the negative pions are $n + n \rightarrow n + p + \pi^-$ or $d + \pi^-$ and $n + p \rightarrow p + p + \pi^-$, and the reaction for the positive pions is $n + p \rightarrow n + n + \pi^+$. The particles of the disintegration were identified by curvature and relative ionization and by characteristic track endings. As many as seven tracks were associated with a single star. Measurements of the energy and momentum of the disintegration fragments gave a minimum energy for the neutrons producing mesons. A weighting factor was computed for each meson which corrected for tracks too slanted to be measured. The angular distribution of the pions was obtained for the laboratory frame and for a special c.m. frame. The fast particles associated with each meson event were identified and tabulated for energy and angle. An absolute cross section of 4.4 mb for meson production by the neutron beam was established by normalizing with respect to ordinary star production for neutron energies above 280 Mev, and by normalizing with respect to the n-p cross section using a beam monitor to relate the data of two cloud chamber experiments. (auth)

3896
Radiation Lab., Univ. of Calif., Berkeley
THE ANGULAR DISTRIBUTION OF THE REACTION $p + p \rightarrow d + \pi^+$ AT 338 MEV (thesis). M. Lynn Stevenson. Apr. 1953. 66p. (UCRL-2188)

The angular distribution of the reaction $p + p \rightarrow \pi^+ + d$ has been measured with the meson and deuteron detected in coincidence. The c.m. cross sections are tabulated below.

Proton energy Mev	Meson energy in the c.m. Mev	$\theta_{c.m.}$	$\frac{d\sigma}{d\Omega} \times 10^{30}$ cm^2/ster
338 ± 1	21.5	30°	35.7 (1 ± 0.11)
		90°	9.98(1 ± 0.17)
332 ± 3	19.0	30°	33.6 (1 ± 0.076)
		60°	15.0 (1 ± 0.11)
		90°	9.92(1 ± 0.075)

The angular distribution of the 338-Mev data is $0.29(1 \pm 0.29) + \cos^2\theta$. The angular distribution of the 332-Mev data obtained by a least-squares fit of the data is $0.32(1 \pm 0.16) + \cos^2\theta$. The average of these two is $0.32(1 \pm 0.14) + \cos^2\theta$. (auth)

3897
ON THE EXISTENCE OF MULTIPLE RESONANCES IN THE ^{63}Cu(γ,n)^{62}Cu REACTION. K. Phillips. Phil. Mag. (7) 44, 533-41(1953) May.

By the accurate control of the energy of a 20-Mev betatron it has been shown that the activation-energy curve consists of a series of small plateaus indicating the existence of narrow resonances for the photoneutron reaction in Cu. (auth)

3898
EXCITATION OF A 16-MICROSECOND STATE IN Ta^{181} BY CAPTURE OF BREMSSTRAHLUNG. Hugh N. Brown and Robert A. Becker. Phys. Rev. 90, 328(1953) Apr. 15.

An isomeric state of Ta was formed by the reaction Ta^{181}(γ,γ')Ta^{181m} using bremsstrahlung from a small betatron. A 0.015-in. Ta target was placed in the x-ray beam, and the γ radiation detected in a NaI(Tl) crystal placed out of the beam about one inch away from the sample. The pulse-height distribution was observed in a ten-channel differential analyzer, sensitive for a period of 50 to 75 μsec following each x-ray burst. The half life of the isomer after background correction was 16 ± 3 μsec, the uncertainty being due only to statistical errors. (auth)

3899
AN INVESTIGATION OF (d,p) STRIPPING REACTIONS. III. RESULTS FOR ^{28}Si AND ^{32}S. J. R. Holt and T. N. Marsham. Proc. Phys. Soc. (London) A66, 467-76(1953) May. (cf. NSA 7-2907).

Angular distribution measurements have been carried out on a number of proton groups emitted as a result of the bombardment by 8-Mev deuterons of targets of natural SiO_2 and S. Using the theory of the stripping process, spins and parities have been assigned to the resulting states of Si^{29} and S^{33}. Certain of these states in both nuclei are thought to be produced by simple excitation of the odd neutron. One of the low states in each case probably involves the first excited state of the nuclear core. The excitation energy of each state in Mev is given, together with the suggested shell model term or the possible spin values and parity. (auth)

3900
POLARIZATION EFFECTS IN (d,p) AND (d,n) REACTIONS. H. C. Newns. Proc. Phys. Soc. (London) A66, 477-83(1953) May.

The particles emitted from (d,p) and (d,n) reactions are shown to be polarized in a plane perpendicular to the plane of scattering. The direction of polarization is shown to be related to the spin changes involved in the reaction. An estimate of the magnitude of the polarization and the angle at which the maximum occurs is made. The effect of the polarization on the angular correlation of the γ rays emitted from the product nucleus when measured in coincidence with the outgoing particle is discussed and a comparison made with the result of Satchelor and Spiers(Proc. Phys. Soc. (London) A65, 980(1952)). (auth)

3901
PHOTOMESONIC FISSION OF BISMUTH. G. Bernardini, R. Reitz, and E. Segrè. Phys. Rev. 90, 573-4(1953) May 15.

The fission of Bi by high-energy photons is detected by a photographic-plate technique and some measurements on the cross section as a function of the photon energy are reported. These suggest that the mechanism for fission is the generation of pions inside of the Bi nucleus, and their subsequent re-absorption in the same nucleus in which they have been produced. This re-absorption generates high-energy nucleons which produce the fission. (auth)

3902
NUCLEAR REACTIONS PRODUCED BY FAST NITROGEN IONS. K. F. Chackett, J. H. Fremlin, and D. Walker. Proc. Phys. Soc. (London) A66, 495(1953) May.

A number of radioactive products have been separated and identified from the bombardment of Al by high-energy (N^{14})$^{6+}$ ions from the Birmingham cyclotron. Measurements of the ion current at the radius of 25 in. indicated ~10^{10} N ions/sec with energies exceeding 50 Mev. The following have been identified from the reaction: K^{38}(half life 7.5 min, β^+ emitter), Cl^{34}(33 min, β^+), P^{32}(14.3 days, β^-), Si^{31}(157 min, β^-), and Na^{24}(14.8 hr, β^-). The mechanism of the reaction has not yet been established. Both α and β activities have been produced in Au and Pt targets with the (N^{14})$^{6+}$ ions. (L.M.T.)

3903
THE REACTION ^{181}Ta(γ,2n)^{179}Ta AT 17.6 MEV AND SOME REMARKS ON NUCLEAR PHOTODISINTEGRATION. J. H. Carver, R. D. Edge, and D. H. Wilkinson. Phil. Mag. (7) 44, 404-24(1953) April.

The problem of determining the variation with γ-ray energy of the total nuclear absorption cross section is discussed with a view to testing the applicability of specific nuclear models such as that of Goldhaver and Teller for the form of the cross section and the validity of the general account of the integrated cross section given by Levinger and Bethe. While for light elements many competing processes must be considered, in the very heavy elements only (γ,2n) is a possible competitor for (γ,n) at not too high energies. The seriousness of this competition is estimated by a measurement of the ratio of the cross sections of $\mathrm{Ta}^{181}(\gamma,2n)\mathrm{Ta}^{179}$ at 17·6 Mev to $\mathrm{Ta}^{181}(\gamma,n)\mathrm{Ta}^{180}$ at 14·6 Mev; the result is $0{\cdot}29 \pm 0{\cdot}11$. This competition is not enough to destroy the apparent 'resonance' character of the absorption. It is pointed out that the large value of $\sigma_{\gamma,n}$ at 17·6 Mev is inconsistent with the idea that a conventional compound nucleus is always formed and so the idea of purely statistical competition for the γ-ray energy should be modified in comparing neutron yields with the predictions of the dipole sum rule. The present measurements are correlated with the neutron yield curve of Halpern, Nathans, and Mann. 55 references. (auth)

3904

NEUTRONS PRODUCED BY HIGH ENERGY PROTONS. T. C. Randle, J. M. Cassels, T. G. Pickavance, and A. E. Taylor. Phil. Mag. (7) 44, 425-36(1953) April.

The energy spectra and yields of neutrons produced by the bombardment of Be, C, Al and U with protons of energy 160 Mev have been measured at an angle near the forward proton direction. (auth)

3905

RECENT STUDIES OF PHOTONUCLEAR REACTIONS. Karl Strauch. Ann. Rev. Nuclear Sci. 2, 105-28(1953).

This review summarizes some of the recent investigations and examines the results with respect to the various models that have been proposed for the mechanism of photonuclear reactions. The term "photonuclear reactions" refers here to any photon-initiated nuclear transformation in which either one or many γ rays, neutrons, protons, or aggregates of nucleons are emitted. Thus photomeson production is not included, except where it appears to play a role in the mechanism of reactions under study. The photodisintegration of D and He is left out, since this topic more properly belongs to the subject of interaction of elementary particles. 87 references. (auth)

3906

NUCLEAR REACTIONS INDUCED BY HIGH ENERGY PARTICLES. David H. Templeton. Ann. Rev. Nuclear Sci. 2, 93-104(1953).

This review discusses briefly some of the main characteristics of spallation, fission, and secondary reactions. 75 references. (L.M.T.)

3907

THE PRODUCTION AND DISTRIBUTION OF NATURAL RADIOCARBON. Ernest C. Anderson. Ann. Rev. Nuclear Sci. 2, 63-78(1953).

Production of natural radioactive C^{14} from the reaction $\mathrm{N}^{14} + \mathrm{n} \rightarrow \mathrm{C}^{14} + \mathrm{p} + 620$ kev is accomplished by cosmic-ray neutrons and the N_2 of the atmosphere. Specifically considered are: $\overline{\mathrm{Q}}$, the number of neutrons captured in the atmosphere/cm^2/sec; B, the amount of inert carbon through which the C^{14} is distributed; and the ratio $\overline{\mathrm{Q}}/\mathrm{B}$, the specific activity of C^{14} in disintegrations/sec/g. The techniques of detecting and measuring C^{14} are reviewed briefly. 73 references. (L.M.T.)

3908

N^{14} LEVEL STRUCTURE FROM THE $\mathrm{C}^{13}(\mathrm{p,n})\mathrm{N}^{13}$ REACTION. J. K. Bair, J. D. Kingston, and H. B. Willard. Phys. Rev. 90, 575-6(1953) May 15.

The neutron yield resulting from proton bombardment of C^{13} has been extended to a proton energy of 5 Mev. Maxima were found at bombarding energies of 3.78, 4.01, 4.10, 4.18, 4.52, and 4.8 Mev. The corresponding energies in the N^{14} compound nucleus are 11.05, 11.26, 11.35, 11.44, 11.74, and 12.0 Mev. (auth)

3909

SOME REMARKS ON THE PHOTODISINTEGRATION OF DEUTERON, II. Jun Fujimura. Progr. Theoret. Phys. (Japan) 9, 132-46(1953) Feb.

Electric interactions at high energies are investigated in the photodisintegration of the deuteron. The contributions of the proton current and the exchange effect are separately studied. It is found that the single-particle approximation is not necessarily valid in the photodisintegration. The angular distribution of this process, in which exchange magnetic interaction is also taken into account, is presented. It shows a fair agreement with the experimental data. (For Part I see NSA 7-2145.) (auth)

3910

THE MECHANISM OF THE REACTION $\mathrm{O}^{16} + h\nu \rightarrow 4\mathrm{He}^4$. C. A. Hsiao and V. L. Telegdi. Phys. Rev. 90, 494-5(1953) May 1.

Although $\sigma(h\nu)$ for the reaction $\mathrm{O}^{16}(\gamma,\alpha)3\mathrm{He}^4$ has recently been reported (Goward and Wilkins, Proc. Phys. Soc. (London) A65, 671(1952)), little is known about the mechanism of the reaction. Preliminary results are presented here from 230 stars observed in 400-μ Ilford E1 plates irradiated with 48-Mev bremsstrahlung. These results indicate that for $h\nu > \sim 25$ Mev the reaction proceeds via C^{12} and Be^8 levels, but that for lower energies it fails to go through these levels. Reasons are advanced for this. (L.M.T.)

3911

ANGULAR DISTRIBUTION OF DEUTERONS FROM $\mathrm{Be}^9(\mathrm{p,d})\mathrm{Be}^8$. B. L. Cohen, E. Newman, T. H. Handley, and A. Timnick. Phys. Rev. 90, 323(1953) Apr. 15.

The angular distribution of deuterons from the reaction $\mathrm{Be}^9(\mathrm{p,d})\mathrm{Be}^8$ (ground state) was measured using the internal, circulating 22-Mev proton beam of the Oak Ridge National Lab. 86-inch cyclotron. The target assembly consisted essentially of a thin Be target at the center of a 3.5-in.-radius semicircular detector holder. The deuterons were detected both by the 3.3-hr activity they induce in Pb by the reaction $\mathrm{Pb}^{208}(\mathrm{d,p})\mathrm{Pb}^{209}$ and by the 15-hr activity they induce in Na by the reaction $\mathrm{Na}^{23}(\mathrm{d,p})\mathrm{Na}^{24}$. Results are compared with the angular distribution obtained for the same reaction in the MIT cyclotron with 5- to 8-Mev deuterons (NP-3434; NSA 5-7222). (auth)

PARTICLE ACCELERATORS

3912

Los Alamos Scientific Lab.

A BETATRON MAGNET VOLTAGE REGULATOR. W. E. Ogle and R. D. England. [1952]. 8p. (AECU-2532; LADC-1360)

An attempt has been made to control a 22-Mev betatron at Los Alamos by holding the time of expansion constant at the peak of the magnetic flux and varying the amplitude of the magnetic flux to control the energy. Under these circumstances the time of expansion is not critical but good control of magnet amplitude is necessary. The voltage regulator described here has therefore been designed to give fine adjustment and close regulation of the voltage across the field coils of the betatron. (auth)

3913

TECHNIQUE OF OBTAINING MONOCHROMATISM OF AN ION BEAM FROM AN ACCELERATOR. Henri Bruck. J. phys. radium. 14, 251-6(1953) Apr. (In French)

The optimum adjustment of an ionic prism monochromato is discussed and the relations between characteristics of the beam, of the monochromator, and of the final current to the target are established. Some numerical examples are given. (J.S.R.)

3914
RECENT PROGRESS IN ACCELERATORS. E. L. Chu and L. I. Schiff. Ann. Rev. Nuclear Sci. 2, 79-92(1953)

The recent progress in accelerators, mainly that which occurred in 1951, is reviewed. The following types of accelerators are discussed: kevatrons, electrostatic generators, cyclotrons, synchrocyclotrons, betatrons, electron and proton synchrotrons, proton and electron linear accelerators, and other accelerating devices. 76 references. (L.M.T.)

3915
NON-LINEARITIES IN THE STRONG-FOCUSING ACCELERATOR. E. R. Caianiello. Nuovo cimento (9) 10, 581-93(1953) May 1. (In English)

The effects of the nonlinearity of the magnetic field due to the fact that it must satisfy the Maxwell equations are estimated with particular regard to a strong-focusing accelerator. They are shown to be negligible if compared with other causes of error, so that the customary linear approximation can be safely used to discuss focusing properties. The appendix contains formulas which exhibit the symmetry properties of the magnetic field and can be used for its calculation if the pole shapes are known, or conversely. (auth)

3916
STABILITY AND PERIODICITY IN THE STRONG-FOCUSING ACCELERATOR. E. R. Caianiello and A. Turrin. Nuovo cimento (9) 10, 594-603(1953) May 1. (In English)

A simple formalism is developed for the study of a strong-focusing accelerator of arbitrary geometry. It is shown to yield readily the necessary and sufficient conditions for stability and for periodicity (with any prescribed period) of the orbits. Criteria are also given which allow the determination of the range of initial conditions for which the orbits are stable. (auth)

3917
ALIGNMENT ERRORS IN THE STRONG-FOCUSING SYNCHROTRON. M. Sands and B. Touschek. Nuovo cimento (9) 10, 604-13(1953) May 1. (In English)

A method is presented for the treatment of errors in alignment between the sectors of a strong-focusing accelerator. Motion in one lateral coordinate only is treated, and the individual sectors are assumed to be ideal. It is found that if the ideal orbits (without misalignments) are periodic in one revolution the effect of the misalignments is to produce unbounded orbits, but that away from such resonances stable orbits exist. Estimates are made of the alignment tolerances required for reasonable amplitudes of the perturbed motion. The essential features of the results are independent of the detailed nature of the guide field so long as the ideal orbits are stable. (auth)

3918
EFFECTS OF MAGNETIC IMPERFECTIONS ON A STRONG-CONVERGENCE COSMOTRON. Joseph Seiden. Compt. rend. 236, 1657-9(1953) Apr. 27. (In French)

Magnetic imperfections, which may be represented by the chance variations Δn_i in the index n_i of the magnetic field, reduce the width, measured in term of n, of the stability regions of the cosmotron. The effect is evaluated quantitatively. (tr-auth)

3919
PRINCIPLE OF THE THEORY OF MOVEMENT OF IONS IN LINEAR ACCELERATORS. Michel-Yves Bernard. Compt. rend. 236, 1655-7(1953) Apr. 27. (In French)

A simple mathematical model is proposed for linear ion accelerators. Starting from a convenient law representing the movement of the particle in constant phase with respect to the acceleration wave, the author derives simple expressions for the fields and movement of any given ion. There is good accord between the numerical results calculated from the theory and the published data. (tr-auth)

RADIATION ABSORPTION AND SCATTERING

3920
Palmer Physical Lab., Princeton Univ.
MULTIPLE ELASTIC SCATTERING OF CHARGED PARTICLES. E. J. Saletan. [1952]. 47p. (NYO-3990)

This paper presents a review of multiple coulomb scattering starting from the basic transfer equation for the distribution of the scattered particles. This equation is derived and solved formally and the treatment of Goudsmit and Saunderson is described and briefly discussed. The work of Butler and its modifications are dealt with, and the connection with the methods of Moliere and Sauter is mentioned. The more comprehensive methods of Wang and Guth are considered, with particular reference to the back scattering. Finally the summary gives a listing of the various formulas and a few figures to indicate the magnitude of the effects. (auth)

3921
Radiation Lab., Univ. of Calif., Berkeley
PROTON-PROTON SCATTERING AT 32.0 MEV. Bruce Cork. Mar. 31, 1953. 3p. (UCRL-2170)

Calculations have been made of the differential cross section for p-p scattering at 18.3 and 32 Mev. The pseudoscalar meson theory was analyzed and comparison was made with the data. Later published data (F. Filmore, Phys. Rev. 83, 1252(1951)) are plotted as transformed to 32.0 Mev assuming a 1/E dependence. Also, the calculated curve of Martin and Verlet is shown on the same graph. The more recent data are observed to be in better agreement with the calculated curve and proportional counter data. (auth)

3922
NUCLEAR INTERACTIONS OF 210 π^- MESONS IN EMULSIONS. A. H. Morrish. Phys. Rev. 90, 674-7(1953) May 15.

A study has been made of the interactions of 210 ± 20-Mev π^- mesons with the nuclei of photographic emulsions which were exposed to the University of Chicago synchrocyclotron. Detailed classification of the events into elastic and inelastic scatterings, stops, and stars permitted some discussion of the mechanisms involved. The mean free path for a nuclear interaction was found to be 25.7 cm, as determined from an examination of 2823 cm of track. The increase in this mean free path over that observed at lower energies at Columbia appears to be primarily due to a decrease in the probability for π^- meson absorption in a nuclear collision. (auth)

3923
THE NEUTRON-ELECTRON INTERACTION. D. J. Hughes, J. A. Harvey, M. D. Goldberg, and Marilyn J. Stafne. Phys. Rev. 90, 497-8(1953) May 1.

When Foldy (Phys. Rev. 87, 693(1952)) found that ~4000 ev of the neutron-electron interaction could be attributed to the neutron moment, it was clear that more accurate measurements were necessary to isolate the electrostatic dissociation effect arising from meson-charge distribution. The experiment used was the mirror reflection of a well-collimated neutron beam from a Bi-liquid O interface, measuring the critical angle for total reflection of the long-wavelength neutrons. Since the form factor for mirror reflection is unity, the neutron-electron scattering is observed at its maximum value and the critical angle for total reflection is then a sensitive measure of the neutron-electron interaction. From the coherent scattering amplitudes (obtained from the ratio of the free-atom cross sections of O and Bi) and the measured critical-angle value a value of 3860 ± 370 ev is obtained for the well depth. From this it is concluded that the electrostatic meson dissociation effect can be no more than a few hundred volts. (L.M.T.)

3924

MEASUREMENT OF NUCLEAR GAMMA-RAY ABSORPTION IN CARBON. R. N. H. Haslam, R. J. Horsley, H. E. Johns, and L. B. Robinson. Can. J. Phys. 31, 636-56(1953) May.

The cross section for the absorption of γ rays by C was determined as a function of photon energy by means of "nuclear detectors." The electronic absorption coefficients in the energy range 12 to 20 Mev are found to be about 1% lower than the theoretical values. The nuclear absorption is shown to exhibit a resonance behavior. The integrated cross section in C is considerably lower than predicted. The contribution of nuclear scattering is found to be negligible. Differences in results as determined by three different detecting reactions, $C^{12}(\gamma,n)C^{11}$, $O^{16}(\gamma,n)O^{15}$, and $S^{32}(\gamma,d)P^{30}$, are discussed on the basis of detector sensitivity. It is suggested that the absorption mechanism can be represented by a continuous absorption on which is superimposed absorption peaks. (auth)

3925

POSITRON-ELECTRON SCATTERING AT 1.3 MEV. Horace A. Howe and K. R. MacKenzie. Phys. Rev. 90, 678-82(1953) May 15.

Using an incident beam energy of 1.3 Mev, the ratio of electron to positron scattering on atomic electrons has been determined for the case where one half of the incident energy is transferred to the atomic electron. The measured ratio is 1.82 ± 0.11, which agrees with the theoretical ratio of 1.83, calculated from the expressions given by Møller and Bhabha when exchange effects are included. The theoretical ratio, excluding exchange effects, is 1.36. (auth)

3926

THE SCATTERING OF FAST POSITRONS BY NUCLEI. L. R. B. Elton and K. Parker. Proc. Phys. Soc. (London) A66, 428-36(1953) May.

It is shown that the effects of finite nuclear size and radiative correction cause considerable modifications to the Mott formula for the cross sections. An exact calculation of the phase shifts is carried through for a simple nuclear model and 20-Mev positrons scattered by Au nuclei. Two approximate phase-shift calculations are made and the singularity occurring in the radial wave equation is investigated. The radiative correction for scattering from light nuclei is found to be the same as for electron scattering. (auth)

3927

ADVANCES IN NUCLEON-NUCLEON SCATTERING EXPERIMENTS AND THEIR THEORETICAL CONSEQUENCES. G. Breit and R. L. Gluckstern. Ann. Rev. Nuclear Sci. 2, 365-98(1953).

Various scattering experiments in the high-energy region (100 to 300 Mev) are discussed, and their interpretations are presented; also the progress in low-energy (0 to 20 Mev) scattering is reviewed, and interpretations are presented in their relation to light nuclei structure and other nuclear force parameters. Advances in phenomenological treatments and methods of calculation are also reviewed. 94 references. (L.M.T.)

3928

MESON NUCLEON SCATTERING. Shigeo Goto. Progr. Theoret. Phys. (Japan) 9, 91-2(1953) Jan.

Using the non-singular theory recently proposed by Kamefuchi and Umezawa (Progr. Theoret. Phys. 8, 579 (1952)), meson-nucleon scattering is calculated using the nucleon propagation function $S_{F'}$ corrected from S_F by pseudovector coupling of the pseudoscalar interaction. (L.M.T.)

3929

PENETRATION AND DIFFUSION OF HARD X-RAYS: POLARIZATION EFFECTS. L. V. Spencer and Charles Wolff. Phys. Rev. 90, 510-14(1953) May 15.

Most calculations of x-ray penetration and diffusion neglect the polarization of the scattered photons. In this paper an investigation is made of the effect of polarization in a typical x-ray penetration problem. The Boltzmann equation is compared with a similar calculation which neglects polarization. The polarization effect increases the intensity of the 100- to 200-kev secondaries by a few percent. (auth)

3930

THE ENERGY LOSS OF PROTONS IN METALLIC FOILS AND MICA. David Kahn. Phys. Rev. 90, 503-9(1953) May 15.

The rate of loss of energy of 500- to 1300-kev protons in various metals and mica has been determined. Foils of Be, Al, Cu, and Au were prepared by evaporation techniques, and the density of the foil was determined by weighing the amount of metal deposited on a known area. The energy loss rate $\Delta E/\Delta x$ was measured with a standard deviation of <3 percent. The energy-loss curve was found to join smoothly to the previously measured curve for lower energy protons (50 kev $< E <$ 350 kev), and to approach the theoretical curves of Bethe and Bloch at the high energy end. (auth)

3931

THE ENERGY LOSS OF LOW ENERGY PROTONS IN SOME GASES. James A. Phillips. Phys. Rev. 90, 532-7(1953) May 15.

Experimental values for the energy loss of protons in H_2, He, N_2, O_2, A, Kr, H_2O, CO_2, and CCl_4 have been obtained in the region from 10 to 80 kev. The energy loss ($\Delta E/\Delta x$) can be expressed for the elementary gases measured in terms of a single curve, with two constants $\Delta E/\Delta x = Lf(ME)$. The energy loss per atom is independent of the target density over the range 0 to 1.5-mm Hg, and the energy loss for compound gases is equal to the sum of their components. (auth)

3932

MEASUREMENT OF THE TRANSPORT MEAN FREE PATH OF THERMAL NEUTRONS IN D_2O BY A BORON POISONING METHOD. S. W. Kash and D. C. Woods. Phys. Rev. 90, 564-6(1953) May 15.

The transport mean free path of thermal neutrons in D_2O was experimentally determined by measuring the change in the relaxation length upon the introduction of known amounts of B_2O_3. The value found for 99.7% pure D_2O was 2.49 ± 0.04 cm. Upon correcting for the small hydrogen impurity, a value of 2.52 ± 0.04 cm was obtained for λ_{tr} in pure D_2O. (auth)

3933

THE CAPTURE AND LOSS OF ELECTRONS BY FISSION FRAGMENTS. George I. Bell. Phys. Rev. 90, 548-57 (1953) May 15.

The effective charge of fission fragments passing through a low-pressure gas is calculated. First the cross section for capture of an electron by a fission fragment of relatively arbitrary charge and velocity is computed on a classical basis. A rough theory is then developed which gives the cross section for loss of an electron through interaction with a gas atom. From these two cross sections is obtained the effective charge. The effective charge of a fragment will increase with the pressure of the substance through which it passes. The probable importance of anomalous effects in

H and He is noted. General agreement between theoretical predictions and experimental results is found. (auth)

3934

THE TRANSMISSION OF ELECTRONS THROUGH THIN METALLIC FOILS. C. H. Chang, C. S. Cook, and H. Primakoff. Phys. Rev. 90, 544-7(1953) May 15.

Experimental studies have been made on the relative transmission of positrons and negatrons in the energy range 50 to 750 kev through Al and Pt windows of an end-window-type G-M counter. In qualitative agreement with the theoretical predictions that more scattering takes place in material having higher atomic number, a Pt foil having the same surface density as a corresponding Al foil shows lower relative transmission at any given energy even though the low energy cutoffs of the two windows are just about the same. Also in qualitative agreement with theory, a larger percentage of positrons than negatrons are transmitted at any given energy for the same Pt foil. Theoretical transmission curves, with an empirically determined constant, have been developed. These curves are in relatively good agreement with the experimental curves. (auth)

3935

CHARGE INDEPENDENCE OF NUCLEAR INTERACTION AND HIGH ENERGY NUCLEON-NUCLEON SCATTERING. Junji Iwadare. Progr. Theoret. Phys. (Japan) 9, 93-4(1953) Jan.

Several authors have suggested new potentials to maintain the charge-independence property of nuclear interactions. Such a charge-independent potential must satisfy the following conditions: (1) give the anomaly of p-p scattering without affecting the n-p scattering strongly, and (2) the large cross section in p-p scattering must appear only at high energy regions. Such potentials are investigated in this note by examining some consequences of the charge-independent interaction. (L.M.T.)

3936

THE EFFECT OF THE EXCITED STATES OF NUCLEONS IN HIGH ENERGY NUCLEON-NUCLEON SCATTERING. Junji Iwadare. Progr. Theoret. Phys. (Japan) 9, 94-5 (1953) Jan.

An explanation of the large p-p scattering cross section at high energies is presented, based on the assumption of the existence of nucleon isobars. (L.M.T.)

3937

THE SCATTERING OF GAMMA-RAY BY NUCLEON AND NUCLEON ISOBARS. Shigeo Minami. Progr. Theoret. Phys. (Japan) 9, 108-16(1953) Feb.

Assuming the nucleon isobar with spin $J = {}^3/_2$, isotopic spin $I = {}^3/_2$, and mass $M = 1210$ Mev, we have studied the scattering of γ rays by nucleons by the covariant perturbation method. As expected, the total cross section varies strongly with the incident γ rays, i.e., the correction for the Klein-Nishina formula at the threshold energy for meson production is only of about 30%, but at the excitation energy of the isobar a remarkable resonance scattering is found. The angular distribution has a tendency to become predominant in the forward direction with increase of incident energy. (auth)

3938

COMPTON OPERATOR. J. M. Lozano and F. M. Medina. Rev. mex. fis. 1, 44-51(1952) Apr. (In Spanish)

A new quantum-electrodynamical operator of the fourth order is derived, applicable to radiative corrections to the Compton effect. (tr-auth)

3939

SCATTERING OF PHOTONS BY AN EXTERNAL FIELD. Fernando E. Prieto. Rev. mex. fis. 1, 182-91(1952) Oct. (In Spanish)

The computation methods of Feynman and Dyson are used to obtain the cross section for the scattering of photons in any given external field. (auth)

RADIATION EFFECTS

3940

Carnegie Inst. of Tech.

PROGRESS REPORT FOR MAY 1, 1952–MAY 1, 1953. R. Smoluchowski, W. Leivo, E. A. Pearlstein, W. J. Smith, and W. Vaughan. May 15, 1953. 6p. (NYO-3126)

A large drop in electrical conductivity of NaCl single crystals previously annealed in He at 650°C was found upon irradiating them in the synchrocyclotron. One-hour irradiation of KCl crystals produced a large increase in their elastic modulus and hardness and a density decrease of 5×10^{-5} g/cm^3. Preliminary results are reported for the following: (1) surface changes in KCl crystals after 12-hr exposure to 50-kv x rays, (2) small-angle x-ray scattering of proton-irradiated and non-irradiated diamond, and (3) radiation effects on the electrical resistance of Cu-Zn alloys at various Zn concentrations. (L.M.T.)

3941

ON THE HEATING RESULTING FROM THE ABSORPTION OF GAMMA-RAYS AT EXTREMELY LOW TEMPERATURES. R. L. Platzman. Phil. Mag. (7) 44, 497-500(1953) May.

The various mechanisms for the conversion of absorbed γ-ray energy to heat are surveyed. It is shown that in dielectric crystals electronic excitation of the constituent molecular groups, followed by dissociation and recombination, and ionization followed by recombination, are to a large extent responsible for the energy dissipation. The partial inhibition, at low temperatures, of the final conversion to heat is discussed, with particular reference to the γ-ray heating method in low-temperature calorimetry. (auth)

3942

ON THE USE OF γ-RAYS IN LOW TEMPERATURE CALORIMETRY. N. Kurti and F. E. Simon. Phil. Mag. (7) 44, 501-3(1953) May.

The effects due to delayed heat evolution that might accompany γ-ray absorption in crystals are discussed. It is concluded that, at least in the experimental conditions and with the substances employed so far, γ-ray heating is a reliable method for use in calorimetry in the 'magnetic' temperature region. (auth)

3943

NATURE OF ATTACK OF METALS BY ION BOMBARDMENT. G. V. Spivak, I. N. Prilezhaeva, and O. I. Savochkina. Doklady Akad. Nauk S.S.S.R. 88, 511-14(1953) Jan. 21. (In Russian)

Observed surface changes in an Al cathode during an electrical discharge are correlated with the crystal structure of the metal. (G.Y.)

RADIOACTIVITY

3944

INVESTIGATION OF THE RADIOACTIVE RADIATIONS OF Ir^{192}, Ag^{110}, AND In^{114}. V. S. Shpinel and N. V. Forafontov. Translated from Zhur. Eksptl'. i Teoret. Fiz. 21, 1376-83 (1951). 14p. (AEC-TR-1404)

A brief abstract of this article appears as NSA 6-3713.

3945

DECAY SCHEME OF MAGNESIUM 28. R. K. Sheline and N. R. Johnson. Phys. Rev. 90, 325(1953) Apr. 15.

A disk of Mg metal was bombarded in an external beam of 39-Mev α particles for production of Mg^{28} from the Mg^{26}(α,2p) reaction. The Mg^{28} was separated as Mg ammonium phosphate and its γ spectra were obtained using a sweep-type differential and integral discriminator similar to the one described by Fairstein (Rev. Sci. Instruments 22, 76(1951)). A decay scheme of the isobaric triplet Mg^{28}-Al^{28}-Si^{28} is presented. (L.M.T.)

3946

THE SHORT-LIVED RADIOISOTOPES P^{28} AND Cl^{32}. Neel W. Glass, Louis K. Jensen, and J. Reginald Richardson. Phys. Rev. 90, 320(1953) Apr. 15.

Two new activities observed from the bombardment of Si and S with 20-Mev protons are ascribed to P^{28} and S^{32}, respectively, as additional members to the radioactive chain B^8, N^{12}, Na^{20}, and Al^{24} reported by Alvarez (Phys. Rev. 80, 519(1950)) and Birge (Phys. Rev. 85, 753(1952)). The half life of the Cl^{32} activity is 0.306 ± 0.004 sec and in addition to positrons it emits γ radiation of 4.8 ± 0.2 Mev. The half life of P^{28} was found to be 0.280 ± 0.010 sec and it emits positrons and γ radiation up to ~7 Mev. The following results on Al^{24} from the $Mg^{24}(p,n)$ reaction are reported: (1) γ radiations of 7.1 ± 0.2, 5.3 ± 0.2, 4.3 ± 0.2, and 2.9 ± 0.2 Mev, and (2) half life of 2.10 ± 0.04 sec. (L.M.T.)

3947

THE MASS SPECTROMETER DETERMINATION OF THE HALF-LIFE OF Kr^{85}. R. K. Wanless and H. G. Thode. Can. J. Phys. 31, 517-19(1953) May.

The half life of Kr^{85} has been redetermined using the high-precision mass-spectrometer method. Several samples of Kr gas extracted from fission-product material have been investigated over a period of seven years. The half life of Kr^{85} has been found to be 10.27 ± 0.18 years. (auth)

3948

AUGER TRANSITIONS IN SILVER. F. A. Johnson and J. S. Foster. Can. J. Phys. 31, 469-71(1953) May.

Twenty of the K Auger lines of Ag have been resolved and estimates of their relative intensities obtained. Comparison with the theoretical intensities calculated by Burhop indicates that the existing theory is not quantitatively correct and that relativistic modifications offer little hope of improvement. Special attention is directed to the K→LL lines where disagreement with theory is most marked. Comparison with similar observations previously reported for Au and Bi shows an interesting agreement in the observed ratio of the intensity of the $K \rightarrow L_{II}L_{III}$ line to that of the $K \rightarrow L_{III}L_{III}$ line, and in the ratio of the intensity of the $K \rightarrow L_{I}L_{III}$ line to that of the $K \rightarrow L_{I}L_{I}$ line. (auth)

3949

RADIATION FROM ^{142}LANTHANUM. A. Vanden Bosch. Physica 19, 374(1953) April.

The absorption curve of La^{142} in Al was obtained from an analysis of the decay curves observed through absorbers of different thickness. The shape of the absorption curve indicated that the β spectrum of La^{142} is complex, and this conclusion was supported by the fact that the β rays measured by coincidence with γ rays were absorbed to a greater extent than the total β rays through the same absorber. The maximum energy amounted to more than 2.5 Mev. Scintillation-spectrometer measurements indicated a characteristic γ ray of 630 kev and another of 870 kev with an intensity of the order of 10% of the former. About the possible occurrence of a γ ray with an energy higher than 1 Mev nothing definite can be said because of the low relative sensitivity of scintillation spectrometers in this region. Gamma rays with energies less than 250 kev may also be present but only with intensities much less than that of the 630-kev ray. (auth)

3950

TIME DISTRIBUTION OF POSITRON ANNIHILATION IN LIQUIDS AND SOLIDS. R. E. Bell and R. L. Graham. Phys. Rev. 90, 644-54(1953) May 15.

The time distribution of the annihilation radiation emerging from liquids and solids, following the absorption by the samples of fast positrons, has been studied by the delayed coincidence method. The mean life of positrons in metals is found to be about 1.5×10^{-10} sec, nearly independent of the metal chosen. Some simple crystals behave similarly, but many amorphous substances, both solid and liquid, show a complex time decay in which about $\frac{2}{3}$ of the positrons annihilate with mean life a few times 10^{-10} sec, and the remaining $\frac{1}{3}$ with mean life from 0.45×10^{-9} sec to 3.5×10^{-9} sec, depending on the substance. This longer lifetime is shown to decrease, in general, as the sample is cooled. Placing the sample in moderate electric and magnetic fields has no detectable effect. The long-delayed radiation is shown to be similar in energy and angular distribution to the more prompt component. Tentative interpretations of these facts are given, but some points still await a full explanation. (auth)

3951

BETA TRANSITIONS AND NUCLEAR STRUCTURE III. THE SUPER-PERMITTED TRANSITIONS. R. Bauchez and R. Nataf. J. phys. radium. 14, 217-25(1953) Apr. (In French) (cf. NSA 6-4187 and 6-4188)

After generalization of the method of Konopinski permitting the classification of β transitions by order of forbiddenness from the value of the product f_n T, the super-permitted or favored β transitions between mirror nuclei and certain light nuclei of the type A = 4n + 2 are studied. A study of the value of their nuclear matrix element compared with the experimental data shows that certain transitions are characterized by a too-high value if an interaction of pure Gamow-Teller type is accepted, but that the value becomes acceptable if a mixture of interactions of the Fermi type (S or V) and the Gamow-Teller (T or A) with the proportions 0.25 ± 0.05 and 0.75 ± 0.05 is admitted. (tr-auth)

3952

β-DECAY ENERGETICS. Charles D. Coryell. Ann. Rev. Nuclear Sci. 2, 305-34(1953).

This review is concerned with the correlation of the total disintegration energy emitted in β processes with the composition of the nucleus undergoing decay. The correlations give information about the energy effects of nuclear shell structure, and they are useful in predicting the decay properties of imperfectly known or unknown nuclear species. 53 references. (auth)

3953

THE EXPERIMENTAL CLARIFICATION OF THE THEORY OF β-DECAY. E. J. Konopinski and L. M. Langer. Ann. Rev. Nuclear Sci. 2, 261-304(1953).

The following aspects of β decay theory are discussed: the *a priori* theoretical basis; selection rules for β transitions; allowed β decay; favored transitions; and "unique"-, once-, and twice-forbidden transitions. The literature survey pertaining to the review was concluded in April, 1952. 101 references. (L.M.T.)

3954

BETA-SPECTRUM OF RADIUM E. J. Pniewski and M. Danysz. Nature 171, 694-5(1953) Apr. 18.

By preparing a very thin source and using electron-sensitive Ilford G5 emulsions as detector, the authors have studied the β spectrum of RaE (Bi^{210}) down to 4.6 kev. Energy and momentum spectra are illustrated. The energy distribution curve probably cuts the I(E) coordinate. From the experimental points it is evident that below 50 kev the distribution function cannot be interpreted in terms of $(E - E_0)^4$. (G.Y.)

3955

GALLIUM 67. B. H. Ketelle, A. R. Brosi, and F. M. Porter. Phys. Rev. 90, 567-73(1953) May 15.

The electron-capture decay of 78-hr Ga^{67} has been investigated with a magnetic-lens spectrometer, a proportional-counter spectrometer, scintillation spectrometers, and combinations of these spectrometers in coincidence. The experimental data indicate that electron capture occurs to 92-, 182-, 388-, and 880-kev levels in Zn^{67}. The lowest level at 92 kev is a metastable one with a half life of 8.5 μsec. Branching ratios and conversion coefficients have been determined from which consistent spin and parity assignments have been made to the Zn^{67} levels. (auth)

3956

NUCLEAR LEVELS ASSOCIATED WITH ZIRCONIUM 95 AND NIOBIUM 95. J. M. Cork, J. M. LeBlanc, D. W. Martin, W. H. Nester, and M. K. Brice. Phys. Rev. 90, 579-81(1953) May 15.

Using sources of Zr^{95}, both as a fission product and as derived from neutron capture in enriched Zr^{94}, in magnetic spectrometers, a study has been made of the β and γ energies and of the half lives associated with the radioactive decay. Zr^{95} emits three β rays of energy about 910, 405, and 360 kev, each followed by a γ transition leading to a radioactive daughter product, Nb^{95}. The γ energies are 758, 725, and 235.2 kev. The Nb^{95} decays by β emission, of energy 165 kev, to Mo^{95} with accompanying γ energies of 753 and 768 kev. The observed transitions are found to fit a level scheme that is not incompatible with shell theory. (auth)

3957

γ RADIATION OF Sb^{124}. K. Gromov, B. Dzhelepov, N. Zhukovskiĭ, A. Silant'ev, and Yu. Khol'nov. Doklady Akad. Nauk S.S.S.R. 86, 255-8(1952) Sept. 11. (In Russian)

The following Sb^{124} → Te^{124} γ-ray energies in kev, with the relative number of γ quanta given in parentheses, were measured with a γ spectrometer utilizing Compton electrons: 597 (1.54), 711 (0.19), 958 (0.066), 1052 (0.044), 1347 (0.17), 1691 (1.00), 2070 (0.10). A 650-kev γ ray reported by several investigators was not observed here but is included in the decay scheme presented. In this scheme the respective number of quanta per decay in order of increasing energy is 0.840, 0.071, 0.112, 0.039, 0.026, 0.101, 0.592, and 0.059. Information on the I^{124} → Te^{124} decay also is included. (G.Y.)

3958

ON THE NATURAL DECAY OF THE FREE NEUTRON. Shô Tanaka and Motô Itô. Progr. Theoret. Phys. (Japan) 9, 169-80(1953) Feb.

The natural decay of the free neutron is investigated where the β transition of the nucleon is considered to be caused by the intermediation of a boson field. The results are compared with those of Fermi's theory and the problem of whether the β coupling belongs to the interaction of the first kind is discussed. (auth)

3959

THE GAMMA-RAY CASCADE FOLLOWING DECAY OF Sc^{46}. Charles E. Whittle and Fred T. Porter. Phys. Rev. 90, 498(1953) May 1.

The report by Nag et al. (Indian J. Phys. 24, 479(1950); Nature 164, 1000(1949)) that a 12-μsec state exists in Ti^{46} and their assignment of this lifetime to the first excited level in Ti^{46} seem in disagreement with other reports on the well-known cascade in Ti^{46} following the negatron decay of Sc^{46}. Using a purified Sc^{46} source and conventional delayed coincidence arrangement with a resolving time of 1.3×10^{-8} sec, the question of γ-γ delay in Ti^{46} was re-investigated with the particular idea that perhaps the delayed coincidences found by Nag, et al., resulted from a weak and previously unidentified γ ray in Ti^{46}. However, no evidence for a state in Ti^{46} with a lifetime greater than 1.5×10^{-9} sec was found. (L.M.T.)

3960

DYSPROSIUM 157. Thomas H. Handley and Elmer L. Olson. Phys. Rev. 90, 500-1(1953) May 1.

Terbium oxide was bombarded with 24-Mev protons in a cyclotron, and upon separation by ion exchange, two radioactive species were found with the Dy fraction. An 8.2 ± 0.1-hr activity from the (p,3n) reaction and a 134-day activity from the (p,n) reaction on Tb^{159} was found. The 134-day activity has been previously assigned to Dy^{159} (Butement, Proc. Phys. Soc. (London) A64, 395(1951)). After running a rough excitation curve the 8.2-hr activity was assigned to Dy^{157}. The γ spectra of Dy^{157} showed peaks at 325, 177, and 42.5 kev. When the 325- and 177-kev peaks were followed only 8.2-hr half lives were found. The 42.5-kev peak decayed into two components, the 8.2-hr and the 134-day activities. No betas or electrons were detected on running a β spectrum. One radioactive species found with the Tb fraction from the ion exchange separation was identified as 74-day Tb^{160} formed by the (n,γ) reaction on Tb^{159}. (L.M.T.)

3961

Cu^{68}, A NEW COPPER ISOTOPE WITH T = 32 SEC HALF LIFE. A. Flammersfeld. Z. Naturforsch. a8, 274-5(1953) Apr. (In German)

A new Cu isotope, Cu^{68}, of 32 ± 2 sec half life was produced by fast-neutron (1.4 Mev) irradiations of Zn and Ga. The radiations of Cu^{68} consist of 3.0 ± 0.2-Mev β^- particles and a weak γ emission. (G.Y.)

3962

THE DECAY SCHEME OF NATURAL LUTETIUM 176. James R. Arnold and Thomas Sugihara. Phys. Rev. 90, 332(1953) Apr. 15.

The γ and x radiation of Lu^{176} was studied using an 0.18-g sample of Lu (as the oxalate) and a low-level spectrometer to redetermine the decay scheme. The results generally confirm those of Goldhaber and Hill (Revs. Mod. Phys. 24, 179(1952)) except for the 90-kev transition, which was not found. It is thought it was probably missed because of its high L and M conversion. (L.M.T.)

3963

THE BETA-SPECTRUM OF Mg^{28}. Luis Marquez. Phys. Rev. 90, 330-1(1953) Apr. 15.

The Mg^{28} for the experiment was prepared by spallation of Si and of K_2SO_4. Previous to the β-spectra studies it was confirmed radiochemically that it was a Mg isotope, and the activity of its daughter Al^{28} was separated and counted. The assignment as Mg^{28} was thus checked and its half life was determined as 20.8 ± 0.5 hr. The Mg^{28} Fermi plot obtained has an allowed shape for energies greater than 100 kev, and the Al^{28} plot has an allowed shape up to where the Mg^{28} begins. The most probable values for the maximum energies obtained are 41.8 ± 10 kev for Mg^{28} and 2850 ± 50 kev for Al^{28}. The log ft value for the decay of Mg^{28} is 4.25 and it is estimated that ~90% of the decay of Mg^{28} goes through the 418-kev β. (L.M.T.)

3964

THE INFLUENCE OF EXTERNAL FIELDS ON ANGULAR CORRELATION. Ernst Heer. Physica 18, 1214-26(1952) Dec. (In English)

Effects of the magnetic field of the electron shell, the inhomogeneous electric field in crystals, the magnetic field of neighboring atoms, and externally applied magnetic fields on angular correlations of successive nuclear emissions are discussed. (G.Y.)

3965

THE β^- HALF-LIFE OF Pu^{241}. D. R. MacKenzie, M. Lounsbury, and A. W. Boyd. Phys. Rev. 90, 327-8(1953) Apr. 15.

The β^- half life of Pu^{241} was found to be 13.0 ± 0.2 years, based on mass-spectrometer and α-pulse analyses of the Pu and the Am^{241} daughter. (L.M.T.)

RARE EARTHS AND RARE-EARTH COMPOUNDS

3966

Ames Lab.

SOME MAGNETIC PROPERTIES OF GADOLINIUM METAL. J. F. Elliott, S. Legvold, and F. H. Spedding. Jan. 15, 1953. 13p. (ISC-306)

The saturation magnetization of Gd has been found to have a $T^{3/2}$ dependence between 20 and 250°K. The saturation magnetization at 0°K, determined by extrapolation, is 253.6 ± 0.6 cgs units, corresponding to 7.12 Bohr magnetons. The data fall considerably below the theoretical curve predicted by the Weiss theory of ferromagnetism for the $^8S_{7/2}$ state. Curie-point determinations have also been made. (auth)

SPECTROSCOPY

3967

THEORY OF ISOTOPIC SHIFT. D. Ivanenko and N. Kolesnikov. Doklady Akad. Nauk S.S.S.R. 89, 253-6(1953) Mar. 11. (In Russian)

Corrections to calculated isotopic shifts in the spectra of heavy elements relative to polarization of the nucleus by the electrons and the mutual screening effect of the electrons are considered. (G.Y.)

THEORETICAL PHYSICS

3968

Harvard Univ.

THE THEORY OF QUANTIZED FIELDS. PART 3. Julian Schwinger. [1953] 33p. (NP-4565)

In this paper the electromagnetic field, as perturbed by a prescribed current is discussed. All quantities of physical interest in various situations, eigenvalues, eigenfunctions, and transition probabilities, are derived from a general transformation function which is expressed in a non-Hermitian representation. The problems treated are: the determination of the energy-momentum eigenvalues and eigenfunctions for the isolated electromagnetic field, and the energy eigenvalues and eigenfunctions for the field perturbed by a time-independent current; the evaluation of transition probabilities and photon-number expectation values for a time-dependent current that departs from zero only within a finite time interval, and for a time-dependent current that assumes non-vanishing time-independent values initially and finally. The results are applied in a discussion of the infrared catastrophe and of the adiabatic theorem. It is shown how the latter can be exploited to give a uniform formulation for all problems requiring the evaluation of transition probabilities or eigenvalue displacements. (For Parts 1 and 2 see NSA 7-3969 and NP-4494; NSA 7-3640.) (auth)

3969

THE THEORY OF QUANTIZED FIELDS. PART I. Julian Schwinger. Phys. Rev. 82, 914-27(1951) June 15.

The conventional correspondence basis for quantum dynamics is [here] replaced by a self-contained quantum dynamical principle from which the equations of motion and the commutation relations can be deduced. The theory is developed in terms of the model supplied by localizable fields. A short review is first presented of the general quantum-mechanical scheme of operators and eigenvectors, in which emphasis is placed on the differential characterization of representatives and transformation functions by means of infinitesimal unitary transformations. The fundamental dynamical principle is stated as a variational equation for the transformation function connecting eigenvectors associated with different spacelike surfaces, which describes the temporal development of the system. It is shown that the requirement of invariance under time reflection imposes a restriction upon the operator properties of fields, which is simply the connection between the spin and statistics of particles. Action integral variations which correspond to changing the dynamical system are discussed briefly. A method for constructing the transformation function is described, in a form appropriate to an integral spin field, which involves solving Hamilton-Jacobi equations for ordered operators. The exceptional nature of time reflection is indicated by the remark that the charge and the energy-momentum vector behave as a pseudoscalar and pseudovector, respectively, for time reflection transformations. (H.F.G.)

3970

RELATIVISTIC EQUATION FOR QUANTUM SCATTERING FUNCTION. Yu. L. Klimontovich. Doklady Akad. Nauk S.S.S.R. 87, 927-30(1952) Dec. 21. (In Russian).

Starting from the canonical form of the equations of relativistic particle motion and the relativistic equation for the scattering function, the author derives relativistic equations for the quantized scattering function, with and without the existence of a self-consistent field. The relation between the equation for the quantum function and the wave equation is demonstrated. (G.Y.)

3971

FREDHOLM THEORY OF SCATTERING IN A GIVEN TIME-DEPENDENT FIELD. Abdus Salam and P. T. Matthews. Phys. Rev. 90, 690-5(1953) May 15.

It is shown that Feynman's relativistic solution for the scattering of an electron (or pair creation) by a given external field is the Fredholm resolvent of the related integral equation and is thus the unique and absolutely convergent solution for any strength of field. (auth)

3972

ON GAUGE INVARIANCE IN ELECTRODYNAMICS AND THE SELF-ENERGY PROBLEMS OF THE PHOTON. Osamu Hara and Hisaichiro Okonogi. Progr. Theoret. Phys. (Japan) 9, 184-5(1953) Feb.

This note briefly discusses the consequence of gage invariance in electrodynamics, why the interaction of the magnetic field must be introduced in a gage-invariant way, and how gage invariance is related to the self-energy problem of the photon. (L.M.T.)

3973

RELATION BETWEEN THEORY OF REGULARIZATION AND THEORY OF PARTICLES WITH ARBITRARY SPIN. Yu. A. Yappa. Doklady Akad. Nauk S.S.S.R. 86, 51-4 (1952) Sept. 1. (In Russian)

Pauli and Villars' method of regularization in relativistic quantum electrodynamics (cf., for example, NSA 3-1772, 5-4925, 6-3731) is interpreted and applied to the theory of elementary particles. (G.Y.)

3974

RELATION BETWEEN METHOD OF REGULARIZATION AND THEORY OF PARTICLES OF ARBITRARY SPIN. V. I. Karpman. Doklady Akad. Nauk S.S.S.R. 89, 257-60(1953) Mar. 11. (In Russian)

Pauli and Villars' method of regularization in relativistic quantum electrodynamics (cf., for example, NSA 3-1772, 5-4925, 6-3731) is interpreted and applied to the theory of elementary particles. (G.Y.)

3975

A COVARIANT FORMULATION OF THE NON-ADIABATIC METHOD FOR THE RELATIVISTIC TWO-BODY PROBLEM. II. M. Cini. Nuovo cimento (9) 10, 614-29(1953) May 1. (In English)

It has been shown in part I of this work (Nuovo cimento (9) 10, 526-39(1953)) how the Tamm-Dancoff nonadiabatic treatment of the relativistic problem of two particles interacting through a neutral pseudoscalar meson field can be put in a covariant form. The integral equations obtained involve infinite kernels corresponding to radiative processes. In the present part II the techniques of Dyson and Matthews for the renormalization of the S-matrix have been applied in order to separate from the kernel of the integral equations a convergent part, showing that the divergent contributions can be absorbed in unobservable mass and coupling constant renormalization. If the normalized masses and charge are assumed to be defined by the same formal series with divergent constant terms as in the S-matrix, as required if a physical meaning is to be attached to the renormalization procedure, finite contributions arise also from self-energy kernels of noninteracting particles. The terms arising from disconnected loops in the vacuum can be eliminated if the same approximation is used as in the S-matrix theory, namely, that the time dependence of the state vector can be neglected in these integrals. (auth)

3976

A COVARIANT FORMULATION OF THE NON-ADIABATIC METHOD FOR THE RELATIVISTIC TWO-BODY PROBLEM. I. M. Cini. Nuovo cimento (9) 10, 126-39(1953) May 1. (In English)

The nonadiabatic treatment of the relativistic two-body problem can be done with the Tamm-Dancoff method, or with the Bethe-Salpeter equation. The first one is formally noncovariant, and no radiative effects can be computed; the latter is covariant, but the physical interpretation of the "wave function" involved is not clear. In the present paper a covariant formulation of the Tamm-Dancoff method is found, with the purpose of performing the renormalization of the divergent terms, thus obtaining a consistent and unambiguous field-theoretical treatment of the two-body bound state. An integral equation of up to fourth-order terms in powers of the coupling constant is given for the representative of the state vector in the interaction representation describing two nucleons at different space-time points. In part II, to be published shortly, the renormalization procedure of such equation will be discussed. (auth)

3977

AN ALGEBRAIC TREATMENT OF THE MANY ELECTRON PROBLEM. Huzio Nakano. Progr. Theoret. Phys. (Japan) 9, 33-73(1953) Jan.

The algebraic structure of the hamiltonian of the many-electron system is studied. Based upon the second quantization scheme, a purely algebraic-theoretical method is established in order to determine the total energies of the many-electron system, where each energy eigenstate of one electron in the Hartree-Fock field of these electrons is occupied by a given number of electrons. This occupation number is either 0, 1 or 2, because of the value, $\frac{1}{2}$, of the electron spin. Only the part of the hamiltonian related to the singly occupied states is found to be algebraically important, in relation to which the so-called exchange algebra emerges. The general principle of how to manipulate this algebra is stated and in some cases a few numbers of singly occupied states are worked out. In the case that the energy eigenstates of the Hartree-Fock field have degeneracies, the theory so far mentioned does not suffice, and more detailed and somewhat complicated study is required. (auth)

3978

THE GENERAL THEORY OF THE INTERACTION REPRESENTATION. I. THE LOCAL FIELD. Yasushi Takahashi and Hiroomi Umezawa. Progr. Theoret. Phys. (Japan) 9, 14-32(1953) Jan.

The general relation between the covariant commutation relation and the Green function of the field equation is given. This relation can be easily applied to find the commutation relation of the free field. With help of this relation the general quantization theory is developed for the system involving the general fields. Moreover, it is proved that the normal dependent term has no effects on the S matrix and on the expectation values of the physical quantities. Several erroneous conclusions in the other developments of the quantization theory are pointed out. (auth)

3979

ALLOWED FINAL STATES FOR ANNIHILATION INTO THREE PHOTONS. F. G. Fumi and L. Wolfenstein. Phys. Rev. 90, 498-9(1953) May 1.

This note presents a study of the consequences of invariance under rotations and reflections for annihilation into three photons, with limitation to the symmetrical case in which three photons of equal frequency are emitted in a plane 120° apart. (L.M.T.)

3980

A STATISTICAL MODEL FOR THE FUNDAMENTAL PROCESS IN THE QUANTUM THEORY OF PARTICLES. Fritz Bopp. Z. Naturforsch. a8, 228-33(1953) Apr. (In German)

The fundamental process in the quantum theory of particles can be described by quantum and correlation statistics. In the latter case, the problem is one of the correlation between two or three time series with alternative sign. (tr-auth)

3981

ANGULAR MOMENTUM OF MULTIPOLE RADIATION. C. Morette De Witt and J. Hans D. Jensen. Z. Naturforsch. a8, 267-70(1953) Apr. (In German)

According to classical electrodynamics, a multipole of order (L,M), oscillating with the frequency ω, radiates angular momentum. The total angular momentum $\mathscr{L}$ emitted per unit of time is directed along the polar axis. Its square is in ratio to the square of the energy W emitted in the same time as $\mathscr{L}^2 : W^2 = M^2 : \omega^2$. For a single quantum of the radiation field, quantum electrodynamics gives, on the contrary, the corresponding ratio $\mathscr{L}^2 : W^2 = L(L+1) : \omega^2$. It is shown that both these expressions are in accord with the correspondence principle. (tr-auth)

3982

DERIVATIVE MATRIX AND SCATTERING MATRIX. Eugene P. Wigner. Rev. mex. fis. 1, 91-101(1952) July. (In English)

Properties of the scattering function S(k) and the ratio R(E) of the wave function to its radial derivative are discussed for the case of simple scattering with definite angular momentum. The necessary conditions which S must fulfil to be derivable from a permissible R are discussed. (G.Y.)

3983

TRANSIENT EFFECTS IN SCATTERING BY A RIGID SPHERE. Marcos Moshinsky. Rev. mex. fis. 1, 28-37 (1952) Apr. (In Spanish)

In previous studies (NSA 6-682, 6-683), the author described the process of nuclear resonance reactions by a formulation in Fock space, using a quantum-mechanical formalism appropriate to this space. In the present paper, he discusses the transient effects associated with scattering by an impenetrable spherical potential. These transient effects are compared with those that appear in the single-level scattering process, and their relevance to the time-energy uncertainty relation is discussed. (G.Y.)

3984

BOUNDARY CONDITIONS AND S FORMALISM IN NUCLEAR SCATTERING. J. M. Lozano and F. M. Medina. Rev. mex. fis. 1, 102-13(1952) July. (In Spanish)

The purpose of the present paper is to find the relation between the S-matrix formalism and the description of interactions by means of boundary conditions. It is shown that in the absence of an essential singularity at ∞ for $S(\kappa)$, the dynamical description suggested in a natural way by the S-formalism gives the same time-dependent wave functions that are obtained when the interactions are represented by boundary conditions. The dynamical description of the S-formalism is extended to the case when $S(\kappa)$ is given in terms of the general $R(\kappa^2)$ function of Wigner, i.e., to the case where $S(\kappa)$ may have an essential singularity at ∞. (auth)

3985

ON A CLASS OF TRANSFORMATIONS OF INTEREST IN NUCLEAR SCATTERING. Marcos Moshinsky. Rev. mex. fis. 1, 114-26(1952) July. (In Spanish)

The present note analyzes the dynamical description of the scattering due to a short-range potential. In particular, it develops a class of transforms that are useful for this dynamical description. A time-dependent Green function for the scattering process is discussed that proceeds from the initial state (plane wave) to the final state (plane plus scattered waves). This Green function can be used to give the motion of any wave packet that initially was outside the potential. The present paper complements a previous dynamical description (NSA 6-682) of a scattering process in which the interaction was represented by appropriate boundary conditions. (auth)

3986

DIFFRACTION IN TIME AND THE DIRAC EQUATION. Marcos Moshinsky. Rev. mex. fis. 1, 151-64(1952) Oct. (In Spanish)

The present note analyzes the transient phenomena that appear when a shutter is opened for a beam of Dirac particles. The purpose of the analysis vs to establish the time-dependent spinors that will be suitable for a dynamical description of the scattering of Dirac particles, following a procedure for spinless particles given elsewhere. The transient Dirac spinors are expressed in terms of Lommel functions of two variables, and their asymptotic properties in the light cone and when $t \rightarrow \infty$ are discussed. The behavior of the transient spinors under Lorentz transformations is analyzed. (auth)

3987

ANOMALOUS MAGNETIC MOMENTS OF NUCLEONS. I. Fernando E. Prieto. Rev. Mex. fis. 1, 64-77(1952) Apr. (In Spanish)

This is the first of a series of three papers devoted to the treatment of the problem of the anomalous magnetic moments of nucleons. In this paper, the Tomonaga-Schwinger's methods of computation have been used to obtain the electromagnetic and mesonic self-energies of nucleons in interaction with an electromagnetic and a pseudoscalar (neutral, charged, and symmetrical) meson field. Both self-energies have been found to be logarithmically divergent. These results will be used in forthcoming papers to calculate the anomalous magnetic moments of nucleons. (auth)

3988

ANOMALOUS MAGNETIC MOMENTS OF NUCLEONS. II. Fernando E. Prieto. Rev. mex. fis. 1, 127-41(1952) July. (In Spanish)

The covariant formalisms of Dyson-Feyman and Schwinger are used to obtain the second-order correction to the nucleon current due to the meson-nucleon coupling. This correction will be used in a forthcoming paper to obtain the anomalous magnetic moments of nucleons. (auth)

3989

ANOMALOUS MAGNETIC MOMENTS OF NUCLEONS. III. Fernando E. Prieto. Rev. mex. fis. 1, 165-81(1952) Oct. (In Spanish)

This is the last of a series of papers devoted to the problem of the anamolous magnetic moments of nucleons. In this paper, the polarization part of the second-order correction to the current operator is calculated, and the corrections to the magnetic moments of nucleons are obtained. It is found that only the symmetrical theory gives corrections to both the proton and the neutron moments. Adjusting the coupling constant to obtain the experimental value of the neutron moment, a value is obtained for the proton moment which is about $^1/_{60}$ of the experimental one. The introduction of the electromagnetic correction does not improve these results because it is too small compared with the mesic correction. (auth)

3990

HIGHER SPIN POLARIZATION IN NUCLEAR REACTIONS. Albert Simon. Phys. Rev. 90, 326(1953) Apr. 15.

This letter is an extension of a previous one (Phys. Rev. 89, 886(1953)) in which a general theorem was reported for the polarization resulting from nuclear reactions. It is pointed out that polarization is just the expectation value in the scattered wave of the tensor of rank unity formed by the spin operator $\underline{i}'$ of the outgoing particle. It is further pointed out that a completely general result can be written down for the expectation value of any irreducible tensor $T_k^{(q)}$ of rank q and component k formed by the spin operator $\underline{i}'$ and such an expression is presented here. The results in the previous letter appeared as a special case of $q = 1$. (L.M.T.)

3991

CONSERVATION LAWS IN CLASSICAL ELECTRODYNAMICS. Otto Bergmann. Phys. Rev. 90, 315(1953) Apr. 15.

In a recent paper Tyabji (Nature 170, 116(1952)) has shown that the symmetrical energy-momentum tensor of Dirac's new classical electrodynamics consists of the sum of the conventional Maxwell tensor and the matter tensor of relativity. This note points out that this energy tensor is valid even in a more general theory, for which no lagrangian has been found. (auth)

3992

A VARIATIONAL APPROACH TO THE UNIPOTENTIAL MANY-ELECTRON PROBLEM. R. T. Sharp and G. K. Horton. Phys. Rev. 90, 317(1953) Apr. 15.

Slater (Phys. Rev. 81, 385(1951)) pointed out the advantage of an approximate solution of the many-electron problem in which all the electrons move in the same potential field and gave a formula for constructing such a potential. In this note a potential, the same for all electrons, is presented such that when it, and consequently the wave functions are given a small variation, the energy of the system remains stationary. A Slater determinant constructed from the one-electron wave functions is used as the wave function of the system. (L.M.T.)